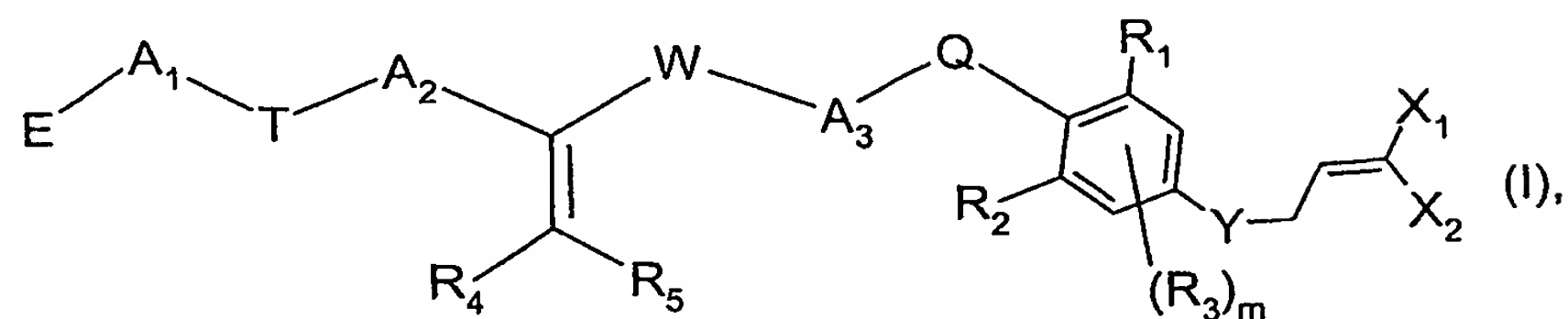


Pesticidally active phenol derivatives

The present invention relates (1) to a compound of formula



wherein

X_1 and X_2 are each independently of the other fluorine, chlorine or bromine;

A_1 and A_2 are each independently of the other a bond or a C_1 - C_6 alkylene bridge which is unsubstituted or substituted by from one to six identical or different substituents selected from halogen and C_3 - C_8 cycloalkyl;

A_3 is a C_1 - C_6 alkylene bridge which is unsubstituted or substituted by from one to six identical or different substituents selected from halogen and C_3 - C_8 cycloalkyl;

R_1 and R_2 are each independently of the other halogen, OH, SH, CN, nitro, C_1 - C_6 alkyl, C_1 - C_6 haloalkyl, C_1 - C_6 alkyl-carbonyl, C_2 - C_6 alkenyl, C_2 - C_6 haloalkenyl, C_2 - C_6 alkynyl, C_1 - C_6 alkoxy, C_1 - C_6 haloalkoxy, C_2 - C_6 alkenyloxy, C_2 - C_6 haloalkenyloxy, C_3 - C_6 alkynyloxy, C_2 - C_6 haloalkynyloxy, $-(S=O)C_1$ - C_6 alkyl, $-S(=O)_2C_1$ - C_6 alkyl or C_1 - C_6 alkoxycarbonyl;

R_3 is H, halogen, OH, SH, CN, nitro, C_1 - C_6 alkyl, C_1 - C_6 haloalkyl, C_1 - C_6 alkyl-carbonyl, C_2 - C_6 alkenyl, C_2 - C_6 haloalkenyl, C_2 - C_6 alkynyl, C_1 - C_6 alkoxy, C_1 - C_6 haloalkoxy, C_2 - C_6 alkenyloxy, C_2 - C_6 haloalkenyloxy, C_3 - C_6 alkynyloxy, $-(S=O)C_1$ - C_6 alkyl, $-S(=O)_2C_1$ - C_6 alkyl, C_1 - C_6 alkoxycarbonyl or C_2 - C_6 haloalkynyloxy; the substituents R_3 being independent of one another when m is 2;

R_4 and R_5 are each independently of the other H, halogen, cyano, nitro, C_1 - C_6 alkyl, C_1 - C_3 haloalkyl, C_1 - C_6 alkoxy- C_1 - C_6 alkyl, C_1 - C_3 alkyl-carbonyl, C_1 - C_3 haloalkylcarbonyl, C_1 - C_6 alkoxycarbonyl, C_3 - C_8 cycloalkyl, C_3 - C_8 cycloalkyl- C_1 - C_6 alkyl or C_3 - C_8 cycloalkylcarbonyl;

m is 1 or 2;

Y is O, NR_6 , S, SO or SO_2 ;

Q is O, NR_7 , S, SO or SO_2 ;

- 2 -

W is a bond, O, NR₇, S, SO, SO₂, -C(=O)-O-, -O-C(=O)-, -C(R₈)=N-O-, -C(=O)-NR₉- or -NR₉-C(=O)-;

T is a bond, O, NR₇, S, SO, SO₂, -C(=O)-O-, -O-C(=O)-, -C(=O)-NR₉- or -NR₉-C(=O)- or -C(R₈)=N-O-;

R₆ and R₇ are each independently of the other H, C₁-C₆alkyl, C₁-C₃haloalkyl, C₁-C₆alkyl-carbonyl, C₁-C₃haloalkylcarbonyl, C₁-C₆alkoxy-C₁-C₆alkyl, C₁-C₆alkoxycarbonyl, C₃-C₈cycloalkyl, C₃-C₈cycloalkyl-C₁-C₆alkyl or C₃-C₈cycloalkylcarbonyl;

R₈ is H, C₁-C₆alkyl, C₁-C₃haloalkyl, C₁-C₆alkoxy-C₁-C₆alkyl or C₃-C₈cycloalkyl;

R₉ is H, C₁-C₆alkyl, C₁-C₃haloalkyl, C₁-C₆alkyl-carbonyl, C₁-C₃haloalkylcarbonyl, C₁-C₆alkoxy-C₁-C₆alkyl, C₁-C₆alkoxycarbonyl or C₃-C₈cycloalkyl; and

E is aryl unsubstituted or substituted from one to five times or heterocyclyl unsubstituted or, depending upon the possibilities of substitution on the ring, substituted from one to four times;

and, where applicable, their possible E/Z isomers, E/Z isomeric mixtures and/or tautomers, in each case in free form or in salt form, to a process for the preparation of those compounds, E/Z isomers and tautomers and to their use in the control of pests, to pesticidal compositions in which the active ingredient has been selected from those compounds, E/Z isomers and tautomers, and to a process for the preparation of those compositions and to their use, to intermediates and, where applicable, their possible E/Z isomers, E/Z isomeric mixtures and/or tautomers, in free form or in salt form, for the preparation of those compounds, where applicable to tautomers, in free form or in salt form, of those intermediates and to a process for the preparation of those intermediates and their tautomers and to their use.

Certain dihaloallyl derivatives are proposed in the literature as active ingredients in pesticidal compositions. The biological properties of those known compounds are not entirely satisfactory in the field of pest control, however, for which reason there is a need to provide further compounds having pesticidal properties, especially for controlling insects and members of the order Acarina, that problem surprisingly being solved by the provision of the present compounds of formula (I).

The compounds of formula (I) and, where applicable, their tautomers are able to form salts, e.g. acid addition salts. The latter are formed, for example, with strong inorganic acids, such as mineral acids, e.g. sulfuric acid, a phosphoric acid or a hydrohalic acid, with strong

organic carboxylic acids, such as unsubstituted or substituted, e.g. halo-substituted, C₁-C₄alkanecarboxylic acids, for example acetic acid, saturated or unsaturated dicarboxylic acids, e.g. oxalic, malonic, maleic, fumaric or phthalic acid, hydroxycarboxylic acids, e.g. ascorbic, lactic, malic, tartaric or citric acid, or benzoic acid, or with organic sulfonic acids, such as unsubstituted or substituted, e.g. halo-substituted, C₁-C₄alkane- or aryl-sulfonic acids, e.g. methane- or p-toluene-sulfonic acid. Furthermore, compounds of formula (I) having at least one acid group are able to form salts with bases. Suitable salts with bases are, for example, metal salts, such as alkali metal or alkaline earth metal salts, e.g. sodium, potassium or magnesium salts, or salts with ammonia or an organic amine, such as morpholine, piperidine, pyrrolidine, a mono-, di- or tri-lower alkylamine, e.g. ethyl-, diethyl-, triethyl- or dimethyl-propyl-amine, or a mono-, di- or tri-hydroxy-lower alkylamine, e.g. mono-, di- or tri-ethanolamine. It may also be possible for corresponding internal salts to be formed. The free form is preferred. Of the salts of compounds of formula (I), preference is given to agrochemically advantageous salts. Hereinabove and hereinbelow any reference to the free compounds of formula (I) or to their salts is to be understood as including, where appropriate, the corresponding salts or the free compounds of formula (I), respectively. The same applies to tautomers of compounds of formula (I) and their salts.

The general terms used hereinabove and hereinbelow have the meanings given below, unless defined otherwise.

Halogen, as a group *per se* and as a structural element of other groups and compounds, such as of haloalkyl, halocycloalkyl, haloalkenyl, haloalkynyl and haloalkoxy, is fluorine, chlorine, bromine or iodine, especially fluorine, chlorine or bromine, more especially fluorine or chlorine, especially chlorine.

Unless defined otherwise, carbon-containing groups and compounds each contain from 1 up to and including 20, preferably from 1 up to and including 18, especially from 1 up to and including 10, more especially from 1 up to and including 6, especially from 1 up to and including 4, more especially from 1 up to and including 3, very especially 1 or 2, carbon atoms; methyl is especially preferred.

Alkylene is a straight-chain or branched bridging member and is especially -CH₂-, -CH₂CH₂-, -CH₂-CH₂-CH₂-, -CH₂-CH₂-CH₂-CH₂-, -CH₂-CH₂-CH₂-CH₂-CH₂-, -CH(CH₃)-, -CH₂(CH₃)CH₂-CH₂-, -CH(C₂H₅)-, -C(CH₃)₂-, -CH(CH₃)CH₂-, -CH(CH₃)CH(CH₃)- or -CH₂C(CH₃)₂-CH₂-.

Alkyl, as a group *per se* and as a structural element of other groups and compounds, such as of haloalkyl, alkoxy, alkoxyalkyl, haloalkoxy, alkoxycarbonyl, alkylthio, haloalkylthio, alkylsulfonyl and alkylsulfonyloxy, is - in each case giving due consideration to the number of carbon atoms contained in the group or compound in question - either straight-chain, e.g. methyl, ethyl, n-propyl, n-butyl, n-hexyl, n-octyl, n-decyl, n-dodecyl, n-hexadecyl or n-octadecyl, or branched, e.g. isopropyl, isobutyl, sec-butyl, tert-butyl, isopentyl, neopentyl or isohexyl.

Alkenyl and alkynyl - as groups *per se* and as structural elements of other groups and compounds, such as of haloalkenyl, haloalkynyl, alkenyloxy, haloalkenyloxy, alkynyloxy or haloalkynyloxy - are straight-chain or branched and each contains two or preferably one unsaturated carbon-carbon bond(s). There may be mentioned by way of example vinyl, prop-2-en-1-yl, 2-methylprop-2-en-1-yl, but-2-en-1-yl, but-3-en-1-yl, prop-2-yn-1-yl, but-2-yn-1-yl and but-3-yn-1-yl.

Cycloalkyl - as a group *per se* and as a structural element of other groups and compounds, such as of cycloalkylalkyl - is cyclopropyl, cyclobutyl, cyclopentyl, cyclohexyl, cycloheptyl or cyclooctyl. Cyclopentyl and cyclohexyl, and especially cyclopropyl, are preferred.

Halo-substituted carbon-containing groups and compounds, such as haloalkyl and haloalkoxy, may be partially halogenated or perhalogenated, the halogen substituents in the case of polyhalogenation being the same or different. Examples of haloalkyl - as a group *per se* and as a structural element of other groups and compounds, such as of haloalkoxy - are methyl substituted from one to three times by fluorine, chlorine and/or bromine, such as CHF_2 , CF_3 or CH_2Cl ; ethyl substituted from one to five times by fluorine, chlorine and/or bromine, such as CH_2CF_3 , CF_2CF_3 , CF_2CCl_3 , CF_2CHCl_2 , CF_2CHF_2 , CF_2CFCl_2 , $\text{CH}_2\text{CH}_2\text{Cl}$, CF_2CHBr_2 , CF_2CHClF , CF_2CHBrF or CClFCHClF ; propyl or isopropyl substituted from one to seven times by fluorine, chlorine and/or bromine, such as $\text{CH}_2\text{CHBrCH}_2\text{Br}$, $\text{CF}_2\text{CHFCH}_2\text{F}$, $\text{CH}_2\text{CF}_2\text{CF}_3$, $\text{CF}_2\text{CF}_2\text{CF}_3$, $\text{CH}(\text{CF}_3)_2$ or $\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl}$; and butyl or an isomer thereof substituted from one to nine times by fluorine, chlorine and/or bromine, such as $\text{CF}(\text{CF}_3)\text{CHFCH}_2\text{F}$, $\text{CF}_2(\text{CF}_2)_2\text{CF}_3$ or $\text{CH}_2(\text{CF}_2)_2\text{CF}_3$.

Aryl is especially phenyl or naphthyl, preferably phenyl.

Heterocyclyl is to be understood as being a five- to seven-membered monocyclic ring containing from one to four hetero atoms selected from the group consisting of N, O and S, or a bicyclic ring system which may contain either in only one ring - such as, for example, in

quinolyl, quinoxaliny, indoliny, benzothiophenyl or benzofuranyl - or in both rings - such as, for example, in pteridiny or puriny - independently of one another, one or more hetero atoms selected from N, O and S. Preference is given to pyridyl, pyrimidyl, triazinyl, tetrazolyl, thienyl, furyl, tetrahydrofuranyl, pyranyl, tetrahydropyranyl, oxazolyl, isoxazolyl, oxazoliny, isoxazoliny, pyrrolyl, pyrazolyl, imidazolyl, thiazolyl, triazolyl, benzoxazolyl, thiadiazolyl, oxadiazolyl, benzothienyl, quinolyl, quinoxaliny, benzofuranyl, benzimidazolyl, benzothiazolyl, indolyl, coumariny and indazolyl, each of which is preferably bonded by way of a carbon atom; special preference is given to pyridyl, thienyl, pyrrolyl, pyrazolyl, imidazolyl, thiazolyl, 1,2,3-triazolyl, 1,2,4-triazolyl, 1,3,4-thiadiazolyl, 1,2,4-thiadiazolyl, oxazolyl, isoxazolyl, 1,2,4-oxadiazolyl and tetrazolyl.

Preferred embodiments within the scope of the invention are

(2) compounds according to (1) of formula (I) wherein A_3 is a straight-chain alkylene bridge, especially methylene, ethylene, propylene or butylene; more especially methylene;

(3) compounds according to (1) or (2) of formula (I) wherein Q is oxygen;

(4) compounds according to (1) to (3) of formula (I) wherein Y is oxygen;

(5) compounds according to (1) to (4) of formula (I) wherein R_1 and R_2 are each independently of the other CN, nitro, C_1 - C_6 alkyl, C_1 - C_6 haloalkyl, fluorine, chlorine or bromine; especially chlorine;

(6) compounds according to (1) to (5) of formula (I) wherein R_3 is hydrogen;

(7) compounds according to (1) to (6) of formula (I) wherein X_1 and X_2 are chlorine or bromine, especially chlorine;

(8) compounds according to (1) to (7) of formula (I) wherein R_4 and R_5 are H, methyl, fluorine or chlorine;

(9) compounds according to (1) to (8) of formula (I) wherein W is a bond;

(10) compounds according to (1) to (9) of formula (I) wherein W is $-C(=O)-O-$, $-C(R_8)=N-O-$ or $-C(=O)-NR_9-$, the carbonyl or imino group being bonded to the central olefin bond of the compound of formula (I), and the oxygen atom or the $-NR_9-$ group of the bridging members W being bonded to A_3 ;

(11) compounds according to (1) to (10) of formula (I) wherein the group A_1-T-A_2 is a bond;

(12) compounds according to (1) to (11) of formula (I) wherein the group A₁-T-A₂ is -O-C₁-C₆alkylene, especially -O-CH₂-;

(13) compounds according to (1) to (12) of formula (I) wherein E is phenyl;

(14) compounds according to (1) to (12) of formula (I) wherein E is pyridyl, pyrimidyl, tetrazolyl, thienyl, oxazolyl, isoxazolyl, oxazolinyl, isoxazolinyl, pyrrolyl, pyrazolyl, imidazolyl, thiazolyl, triazolyl, benzoxazolyl, thiadiazolyl and oxadiazolyl;

(15) compounds according to (1) to (14) of formula (I) wherein the substituents of E are each independently of the other(s) selected from the group consisting of halogen, OH, SH, =O, =S, CN, nitro, C₁-C₆alkyl, C₁-C₆haloalkyl, C₁-C₆alkoxy-C₁-C₆alkyl, C₂-C₆alkenyl-oxy-C₁-C₆alkyl, C₂-C₆alkynyloxy-C₁-C₆alkyl, C₁-C₆haloalkoxy-C₁-C₆alkyl, C₂-C₆haloalkenyl-oxy-C₁-C₆alkyl, C₂-C₆haloalkynyloxy-C₁-C₆alkyl, C₂-C₆alkenyl, C₂-C₆haloalkenyl, C₂-C₆alkynyl, C₂-C₆haloalkynyl, C₁-C₆alkoxy, C₁-C₆cyanoalkoxy, C₁-C₆haloalkoxy, C₂-C₆alkenyloxy, C₂-C₆haloalkenyloxy, C₃-C₆alkynyloxy, C₃-C₆haloalkynyloxy, -(S=O)-C₁-C₆alkyl, -S(=O)₂-C₁-C₆alkyl, C₁-C₆alkyl-N(R₁₀)₂, wherein the two R₁₀s are independent of one another; -C(R₁₁)=NOR₁₂, -C(=NOR₁₂)-C(R₁₁)=NOR₁₂, C₁-C₆alkyl-C(R₁₁)=NOR₁₂, -(CH₂)_n-U₁-C(=O)-U₂R₁₃, -N(R₁₄)R₁₅, -C(R₁₈)=C(R₁₉)R₂₀, aryl, heterocyclyl and heterocyclyloxy; the aryl, heterocyclyl and heterocyclyloxy radicals being unsubstituted or substituted by from one to three identical or different substituents selected from halogen, OH, SH, =O, =S, CN, nitro, C₁-C₆alkyl, C₁-C₆haloalkyl, C₁-C₆alkoxy-C₁-C₆alkyl, C₂-C₆alkenyl-oxy-C₁-C₆alkyl, C₂-C₆alkynyloxy-C₁-C₆alkyl, C₁-C₆haloalkoxy-C₁-C₆alkyl, C₂-C₆haloalkenyl-oxy-C₁-C₆alkyl, C₂-C₆haloalkynyloxy-C₁-C₆alkyl, C₂-C₆alkenyl, C₂-C₆haloalkenyl, C₂-C₆alkynyl, C₂-C₆haloalkynyl, C₁-C₆alkoxy, C₁-C₆cyanoalkoxy, C₁-C₆haloalkoxy, C₂-C₆alkenyloxy, C₂-C₆haloalkenyloxy, C₃-C₆alkynyloxy, C₃-C₆haloalkynyloxy, -(S=O)-C₁-C₆alkyl, -S(=O)₂-C₁-C₆alkyl, C₁-C₆alkyl-N(R₁₀)₂ wherein the two R₁₀s are independent of one another; -C(R₁₁)=NOR₁₂, -C(=NOR₁₂)-C(R₁₁)=NOR₁₂, C₁-C₆alkyl-C(R₁₁)=NOR₁₂, -(CH₂)_n-U₁-C(=O)-U₂R₁₃, -N(R₁₄)R₁₅ and -C(R₁₈)=C(R₁₉)R₂₀;

U₁ and U₂ are each independently of the other a bond, O or NR₇;

n is 0, 1, 2, 3 or 4;

R₁₀ is H, C₁-C₆alkyl, C₁-C₆haloalkyl, C₁-C₆alkyl-carbonyl, C₁-C₆haloalkylcarbonyl, C₁-C₆alkoxy-C₁-C₆alkyl, C₁-C₆alkoxycarbonyl, C₃-C₈cycloalkyl or C₃-C₈cycloalkylcarbonyl;

R₁₁ and R₁₃ are each independently of the other H, C₁-C₆alkyl, C₁-C₆haloalkyl, C₁-C₆cyanoalkyl, C₁-C₆alkoxy-C₁-C₆alkyl, C₂-C₆alkenyl, C₂-C₆haloalkenyl, C₂-C₆alkynyl,

C₃-C₆haloalkynyl, aryl, benzyl, heterocyclyl; or aryl, benzyl or heterocyclyl, each substituted by from one to three identical or different substituents selected from halogen, OH, SH, =O, =S, CN, nitro, C₁-C₆alkyl, C₁-C₆haloalkyl, C₁-C₆alkoxy-C₁-C₆alkyl, C₂-C₆alkenyloxy-C₁-C₆alkyl, C₂-C₆alkynyloxy-C₁-C₆alkyl, C₁-C₆haloalkoxy-C₁-C₆alkyl, C₂-C₆haloalkenyloxy-C₁-C₆alkyl, C₂-C₆haloalkynyloxy-C₁-C₆alkyl, C₂-C₆alkenyl, C₂-C₆haloalkenyl, C₂-C₆alkynyl, C₂-C₆haloalkynyl, C₁-C₆alkoxy, C₁-C₆cyanoalkoxy, C₁-C₆haloalkoxy, C₂-C₆alkenyloxy, C₂-C₆haloalkenyloxy, C₃-C₆alkynyloxy, C₃-C₆haloalkynyloxy, -(S=O)-C₁-C₆alkyl, -S(=O)₂-C₁-C₆alkyl and C₁-C₆-alkyl-N(R₁₀)₂ wherein the two R₁₀s are independent of one another;

R₁₂ is H, C₁-C₆alkyl, C₁-C₆haloalkyl, C₁-C₆alkoxy-C₁-C₆alkyl, C₂-C₆alkenyl, C₂-C₆haloalkenyl, C₂-C₆alkynyl or C₂-C₆haloalkynyl;

R₁₄ and R₁₅ are each independently of the other H, C₁-C₆alkyl, C₃-C₈cycloalkyl, C₃-C₈cycloalkyl-C₁-C₆alkyl, C₁-C₆haloalkyl, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₂-C₆alkenyloxy, C₂-C₆haloalkenyloxy, C₃-C₆alkynyloxy, -C(=O)R₁₆, -C(=S)R₁₆, phenyl, benzyl; or phenyl, phenylcarbonyl or benzyl which are each substituted in the aromatic ring by from one to five identical or different substituents selected from the group consisting of halogen, C₁-C₆alkyl, halo-C₁-C₆alkyl, C₁-C₆alkoxy, halo-C₁-C₆alkoxy, hydroxy, cyano and nitro; or

R₁₄ and R₁₅ together form a straight-chain or branched alkylene bridge having from four to eight members, wherein a CH₂ group may have been replaced by O, S or NR₁₇, and the alkylene bridge is unsubstituted or substituted by from one to four identical or different substituents selected from C₃-C₈cycloalkyl, C₃-C₈cycloalkyl-C₁-C₆alkyl and C₁-C₃haloalkyl;

R₁₆ is C₁-C₆alkyl, C₁-C₆haloalkyl, C₂-C₆alkenyl, C₂-C₆haloalkenyl, C₂-C₆alkynyl, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₂-C₆alkenyloxy, C₂-C₆haloalkenyloxy, C₃-C₆alkynyloxy, C₃-C₆cycloalkyl, phenyl, benzyl; or phenyl or benzyl, each unsubstituted or substituted by from one to three identical or different substituents selected from halogen, CN, nitro, C₁-C₆alkyl, C₁-C₆haloalkyl, C₁-C₆alkyl-carbonyl, C₂-C₆alkenyl, C₂-C₆haloalkenyl, C₂-C₆alkynyl, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₁-C₆alkoxycarbonyl, C₁-C₃haloalkoxycarbonyl and C₂-C₆haloalkenyloxy;

R₁₇ is H, C₁-C₆alkyl, C₁-C₃haloalkyl, C₁-C₃haloalkylcarbonyl, C₁-C₆alkoxyalkyl, C₁-C₆alkyl-carbonyl or C₃-C₈cycloalkyl;

R₁₈ is H, C₁-C₆alkyl, halo-C₁-C₆alkyl, C₁-C₆alkoxy-C₁-C₆alkyl, C₃-C₆cycloalkyl or phenoxy-C₁-C₆alkyl; or together with R₁₉ is a bond;

R_{19} is CN, NO_2 , $-\text{C}(=\text{NOR}_{22})-\text{R}_{21}$, $-(\text{C}=\text{O})-\text{R}_{23}$, $\text{R}_{24}-\text{O}-\text{C}_1-\text{C}_6\text{alkyl}$, $-\text{CH}(\text{O}-\text{R}_{26})_2$, or together with R_{18} is a bond;

R_{20} is H, $\text{C}_1-\text{C}_6\text{alkyl}$, $\text{C}_1-\text{C}_6\text{haloalkyl}$, $\text{C}_3-\text{C}_6\text{cycloalkyl}$, $\text{C}_1-\text{C}_6\text{alkoxy}$, $\text{C}_1-\text{C}_3\text{haloalkoxy}$, $\text{C}_1-\text{C}_6\text{alkylamino}$, $\text{C}_2-\text{C}_6\text{alkenyl}$, $\text{C}_2-\text{C}_6\text{alkynyl}$, $\text{C}_2-\text{C}_6\text{haloalkenyl}$ or $\text{C}_2-\text{C}_6\text{haloalkynyl}$; or

R_{19} and R_{20} together with the carbon atom to which they are bonded form a five- to seven-membered ring, which may contain from one to three hetero atoms selected from O, N and S, and which is unsubstituted or substituted by from one to three identical or different substituents selected from halogen, OH, =O, SH, =S, =N-OH, =N-O- $\text{C}_1-\text{C}_6\text{alkyl}$, CN, nitro, $\text{C}_1-\text{C}_6\text{alkyl}$, $\text{C}_1-\text{C}_6\text{haloalkyl}$, $\text{C}_1-\text{C}_6\text{alkyl-carbonyl}$, $\text{C}_2-\text{C}_6\text{alkenyl}$, $\text{C}_2-\text{C}_6\text{haloalkenyl}$, $\text{C}_2-\text{C}_6\text{alkynyl}$, $\text{C}_1-\text{C}_6\text{alkoxy}$ and $\text{C}_1-\text{C}_6\text{haloalkoxy}$;

R_{21} is H, $\text{C}_1-\text{C}_6\text{alkyl}$, $\text{C}_1-\text{C}_6\text{haloalkyl}$, $\text{C}_2-\text{C}_6\text{alkenyl}$, $\text{C}_2-\text{C}_6\text{haloalkenyl}$, $\text{C}_2-\text{C}_6\text{alkynyl}$ or $\text{C}_2-\text{C}_6\text{haloalkynyl}$;

R_{22} is H, $\text{C}_1-\text{C}_6\text{alkyl}$, $\text{C}_3-\text{C}_6\text{cycloalkyl}-\text{C}_1-\text{C}_6\text{alkyl}$, $\text{C}_2-\text{C}_6\text{alkenyl}$ or $\text{C}_3-\text{C}_6\text{alkynyl}$;

R_{23} is H, OH, $\text{C}_1-\text{C}_{12}\text{alkyl}$, $\text{C}_1-\text{C}_6\text{alkoxy}$, $\text{C}_1-\text{C}_{12}\text{haloalkyl}$, $\text{C}_1-\text{C}_6\text{haloalkoxy}$, $-\text{N}(\text{R}_{25})_2$, $\text{C}_3-\text{C}_6\text{cycloalkyl}$, aryl, aryloxy, benzyloxy, heterocyclyl or heterocyclyloxy; and

R_{24} is H, $\text{C}_1-\text{C}_6\text{alkyl}$, $\text{C}_1-\text{C}_6\text{haloalkyl}$, $\text{C}_2-\text{C}_6\text{alkenyl}$, $\text{C}_2-\text{C}_6\text{haloalkenyl}$, $\text{C}_3-\text{C}_6\text{alkynyl}$, $\text{C}_3-\text{C}_6\text{cycloalkyl}$, $\text{C}_3-\text{C}_6\text{cycloalkyl}-\text{C}_1-\text{C}_6\text{alkyl}$ or $\text{C}_1-\text{C}_6\text{alkoxy}-\text{C}_1-\text{C}_6\text{alkyl}$;

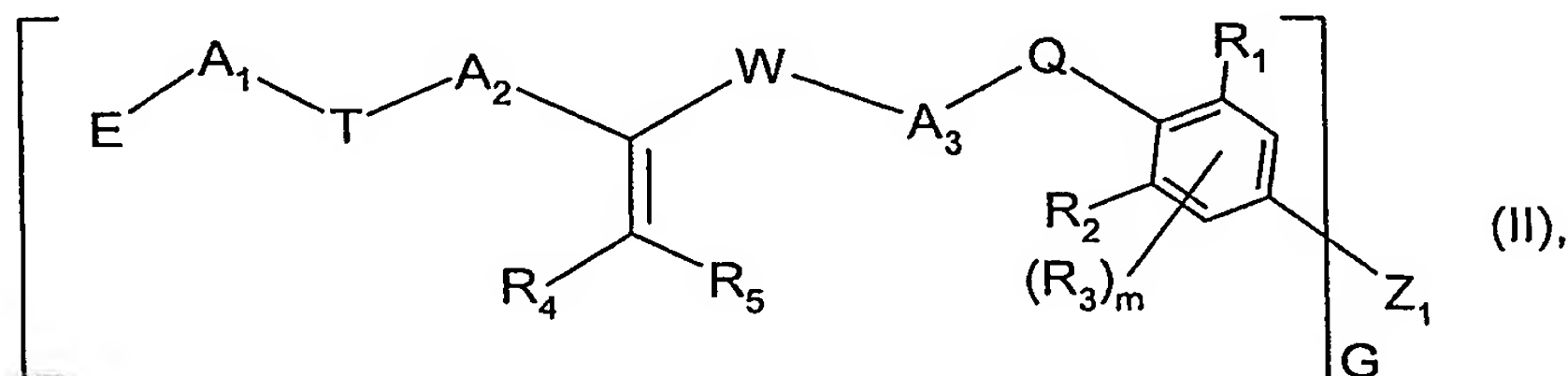
the two R_{25} s are each independently of the other H, $\text{C}_1-\text{C}_{12}\text{alkyl}$ or benzyl; and

the two R_{26} s are each independently of the other $\text{C}_1-\text{C}_{12}\text{alkyl}$ or benzyl or together form a $\text{C}_2-\text{C}_6\text{alkylene}$ bridge.

Special preference is given to the compounds listed in the Tables.

The invention relates also to a process for the preparation of a compound of formula (I), or a salt thereof, wherein

(a) a compound of formula

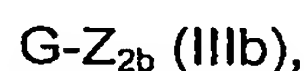


wherein E, W, Q, T, A₁, A₂, A₃, R₁, R₂, R₃, R₄, R₅ and m are as defined for formula (I) under (1), Z₁ is -C(=O)R₂₇ and R₂₇ is H or C₁-C₆alkyl, is converted in the presence of an oxidising agent, especially a peracid, into a compound of formula

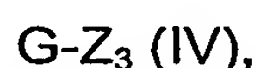


wherein Z_{2a} is O-C(=O)-C₁-C₆alkyl, and G denotes the part of the formula in the brackets designated G in formula (II); either

(b) a compound of formula (IIIa) above or of formula

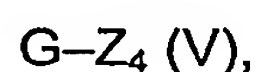


wherein G denotes the part of the formula in the brackets designated G in formula (II), Z_{2b} is a radical of formula -Y-C(=O)R₂₈, Y is as defined for formula (I) under (1), and R₂₈ is C₁-C₁₂alkyl unsubstituted or substituted by from one to three identical or different halogen substituents, or is phenyl unsubstituted or substituted by from one to three identical or different substituents selected from halogen, CN, nitro, C₁-C₆alkyl, C₁-C₆haloalkyl, C₁-C₆alkylcarbonyl, C₂-C₆alkenyl, C₂-C₆haloalkenyl, C₃-C₆alkynyl, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₁-C₆alkoxycarbonyl and C₂-C₆haloalkenyloxy, is converted by hydrolytic cleavage into a compound of formula



wherein G denotes the part of the formula in the brackets designated G in formula (II), Z₃ is YH, and Y is as defined for formula (I) under (1); or

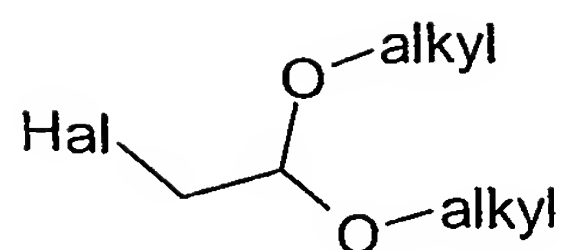
(c) a compound of formula



wherein Z₄ is Y-CH₂-phenyl, wherein the phenyl radical is unsubstituted or substituted by from one to three identical or different substituents selected from halogen, CN, nitro, C₁-C₆alkyl, C₁-C₆haloalkyl, C₁-C₆alkyl-carbonyl, C₂-C₆alkenyl, C₂-C₆haloalkenyl, C₃-C₆alkynyl, C₁-C₆alkoxy, C₁-C₆haloalkoxy, C₁-C₆alkoxycarbonyl and C₂-C₆haloalkenyloxy, G denotes the part of the formula in the brackets designated G in formula (II), and Y is as defined for formula (I), is converted by removal of the benzyl group into a compound of formula (IV), as defined above;

(d) the compound of formula (IV) so obtained is reacted in the presence of a base with a compound of formula

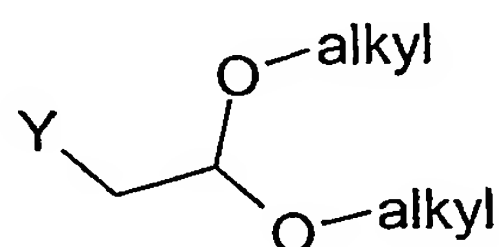
- 10 -



wherein Hal is halogen, preferably bromine or chlorine, and alkyl is C₁-C₆alkyl, or the two alkyl radicals together form a C₃-C₈alkylene bridge, to form a compound of formula

G-Z₅ (VI),

wherein G denotes the part of the formula in the brackets designated G in formula (II) and Z₅ is



wherein alkyl and Y are as defined above;

(e) the compound of formula (VI) so obtained is converted by deprotection of the acetal function in the presence of an acid into a compound of formula

G-Z₆ (VII),

wherein Z₆ is a group -Y-CH₂-C(=O)H, G is as defined above for the compound of formula (II), and Y is as defined for formula (I) under (1), either

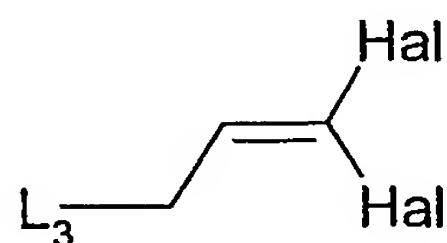
(f₁) for the preparation of a compound of formula (I) wherein X₁ and X₂ are chlorine or bromine, a compound of formula (VII) is reacted in the presence of a phosphine with a compound of formula C(X)₄ wherein X is chlorine or bromine; or

(f₂) for the preparation of a compound of formula (I) wherein X₁ and X₂ are chlorine, a compound of formula (VII) is reacted first with CCl₃-COOH or with chloroform in the presence of a strong base, then with acetic anhydride and subsequently with powdered zinc in acetic acid; or

(f₃) for the preparation of a compound of formula (I) wherein X₁ is fluorine and X₂ is chlorine or bromine, a compound of formula (VII) is reacted first with a compound of the formula CF₂X₂, of the formula CFX₃, of the formula CF₂XC(=O)ONa or of the formula CFX₂C(=O)ONa, in the presence of a phosphine; or

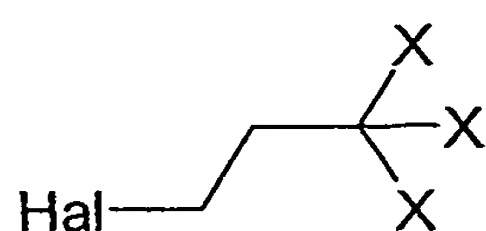
- 11 -

(g₁) for the preparation of a compound of formula (I) wherein X₁ and X₂ are chlorine or bromine, a compound of formula (IV) is reacted in the presence of a base with a compound of formula

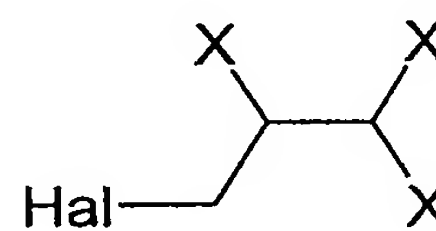


wherein L₃ is a leaving group, preferably chlorine or bromine, and Hal is chlorine or bromine; or

(g₂) for the preparation of a compound of formula (I) wherein X₁ and X₂ are chlorine or bromine, a compound of formula (IV) is reacted in the presence of a base with a compound of formula



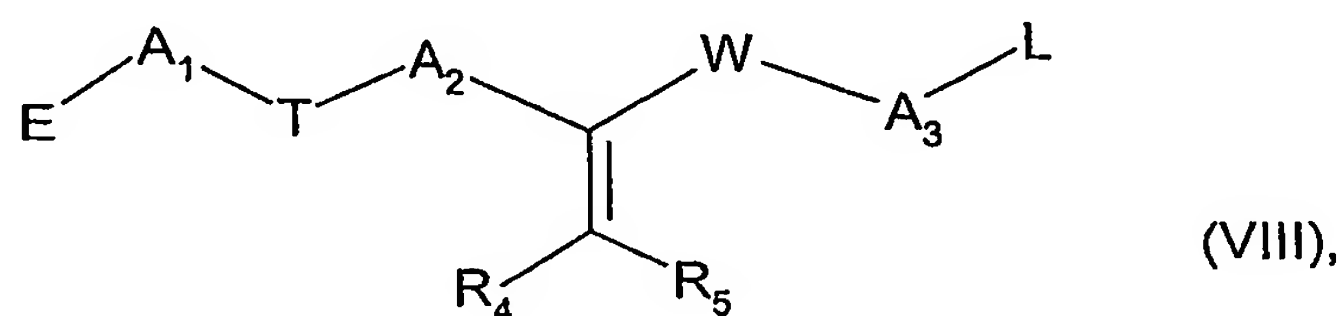
or of formula



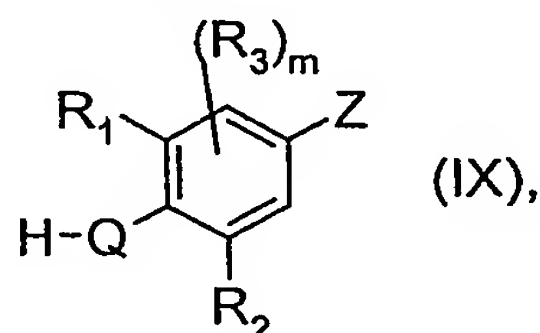
wherein Hal is halogen and X is chlorine or bromine.

The invention relates also to

(h) a process for the preparation of a compound of formula (I), as defined under (1), and wherein Q is O, NR₇ or S, and R₇ is as defined for formula (I) under (1), wherein a compound of formula

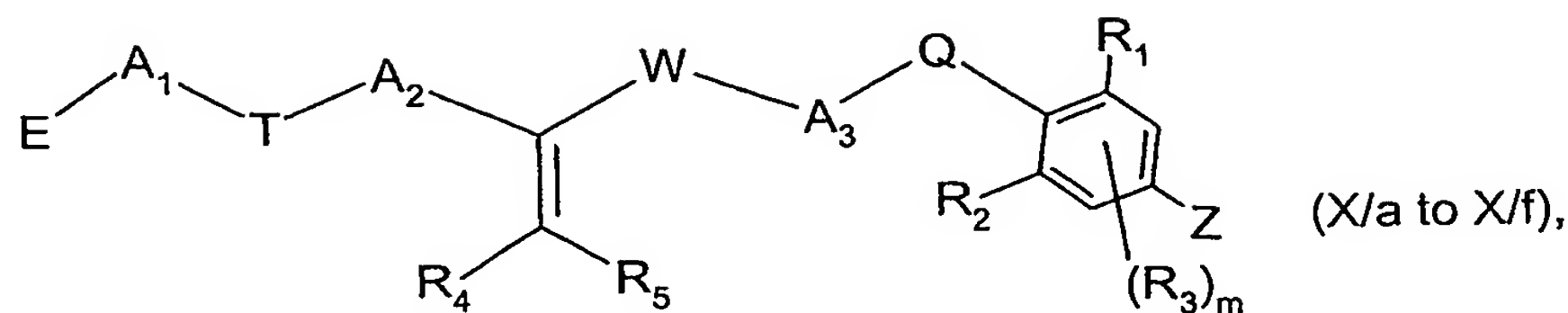


wherein A₁, A₂, A₃, T, W, R₄ and R₅ are as defined for formula (I) under (1), and L is a leaving group, is reacted in the presence of a base with a compound of formula



wherein R₁, R₂, R₃ and m are as defined for formula (I) under (1), Q is O, NR₇ or S and Z is one of the radicals Z₁ to Z₆ as defined for formulae (II) to (VII) above, and R₇ is as defined for formula (I) under (1), and the resulting compound of formula

- 12 -

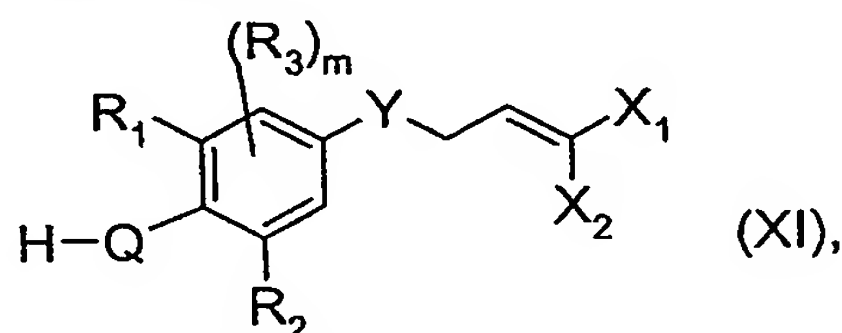


wherein E, T, W, Q, A₁, A₂, A₃, R₁, R₂, R₃, R₄, R₅ and m are as defined for formula (I) under (1) and Z is one of the radicals Z₁ to Z₆ as defined for formulae (II) to (VII) above, is, as necessary, that is to say according to the meaning of the radical Z, reacted further analogously to one or more of process steps (a) to (g).

In the compounds of formulae X/a to X/f, Z in compound X/a has the same meanings as Z₁ in the compound of formula (II), Z in compound X/b has the same meanings as Z₂ in formula (III), and so on.

The invention relates also to

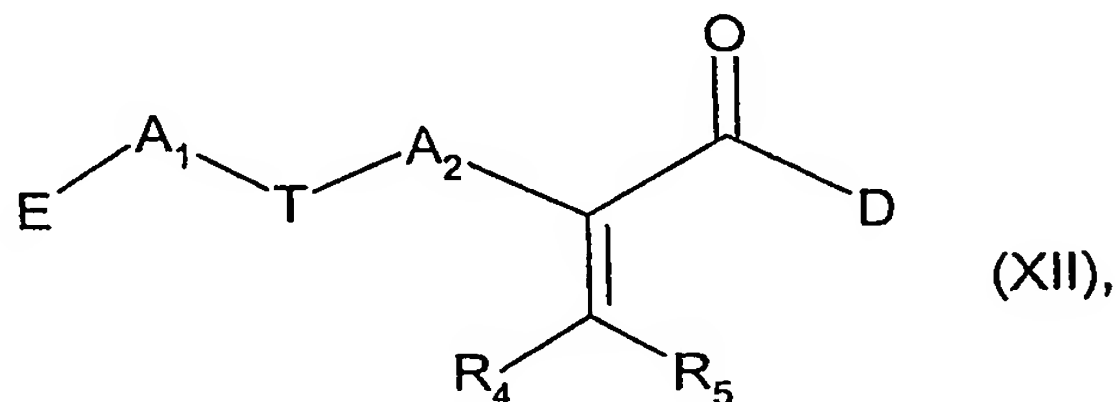
(i) a process for the preparation of a compound of formula (I) as defined under (1) above, wherein a compound of formula (VIII) as defined above, is reacted analogously to process step (h) with a compound of formula



wherein R₁, R₂, R₃, Q, X₁, X₂, Y and m are as defined for formula (I) under (1).

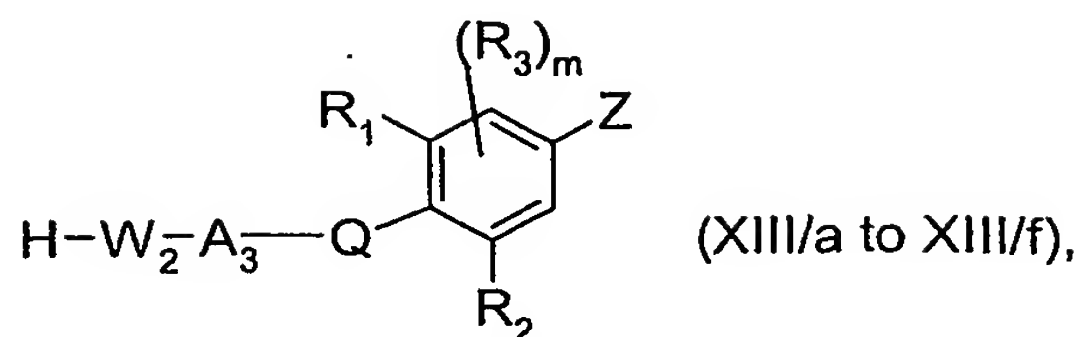
The invention relates also to

(k) a process for the preparation of a compound of (I) as defined above, wherein W is -C(=O)-O- or -C(=O)-NR₉- and R₉ is as defined for formula (I) under (1), wherein a compound of formula



wherein E, T, A₁, A₂, R₄ and R₅ are as defined for formula (I) under (1) and D is a halogen atom, especially chlorine or bromine, or is OH, is reacted with a compound of formula

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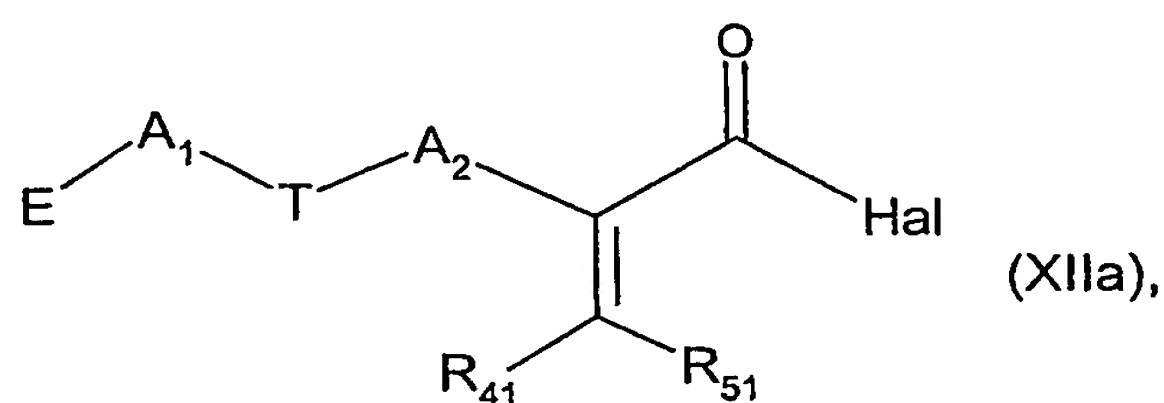
wherein W_2 is O or NR_9 , and Q, A_3 , R_1 , R_2 , R_3 , R_9 and m are as defined for formula (I) under (1), and Z is one of the radicals Z_1 to Z_6 as defined in formulae (II) to (VII) above,

and a resulting compound of formula (Xa) to (Xf), wherein W is $-C(=O)-O-$, as defined above, is, as necessary, that is to say according to the meaning of the radical Z, reacted further analogously to one or more of process steps (a) to (g); or a compound of formula (XII) is reacted with a compound of formula (XI) analogously to process step (i).

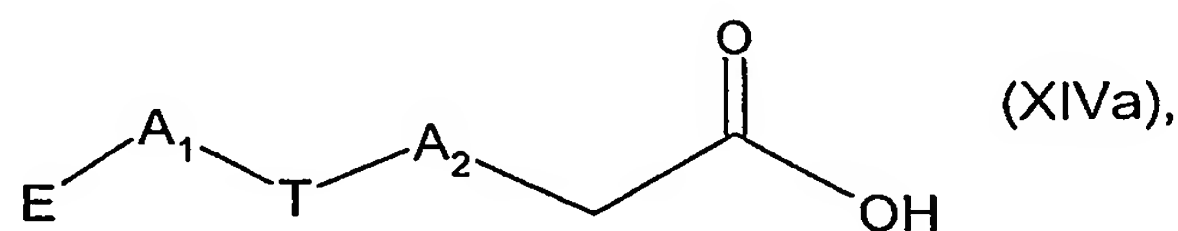
In the compounds of formulae X/a to X/f and XIII/a to XIII/f, the radicals Z are as defined above for the compounds X/a to X/f; that is to say, Z in the compound of formula XIII/a has the same meanings as Z_1 in the compound of formula (II), and Z in compound XIII/b has the same meanings as Z_2 in formula (III), and so on.

The invention relates also to

(I₁) a process for the preparation of a compound of formula

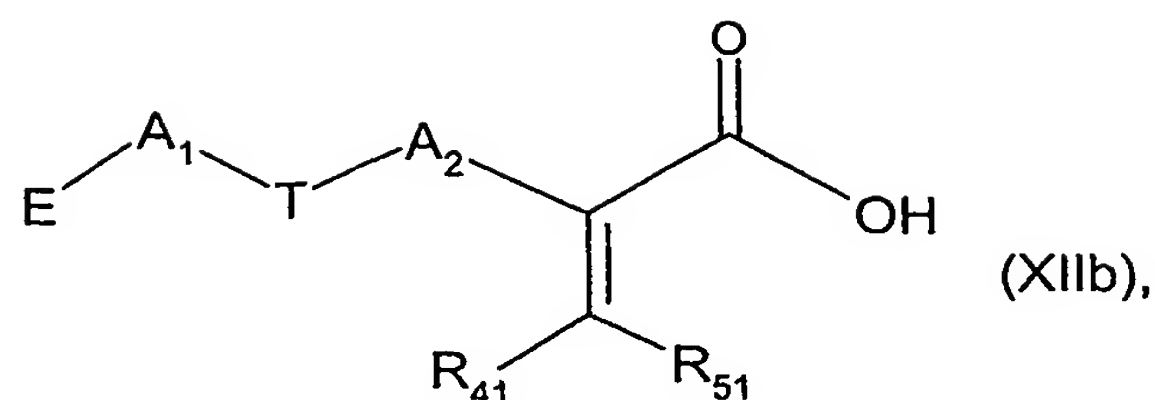


wherein E, T, A_1 and A_2 are as defined for formula (I) and R_{41} and R_{51} are C_1 - C_6 alkyl, C_1 - C_3 haloalkyl, C_1 - C_6 alkoxy- C_1 - C_6 alkyl, C_3 - C_8 cycloalkyl, or C_3 - C_8 cycloalkyl- C_1 - C_6 alkyl, wherein a compound of formula



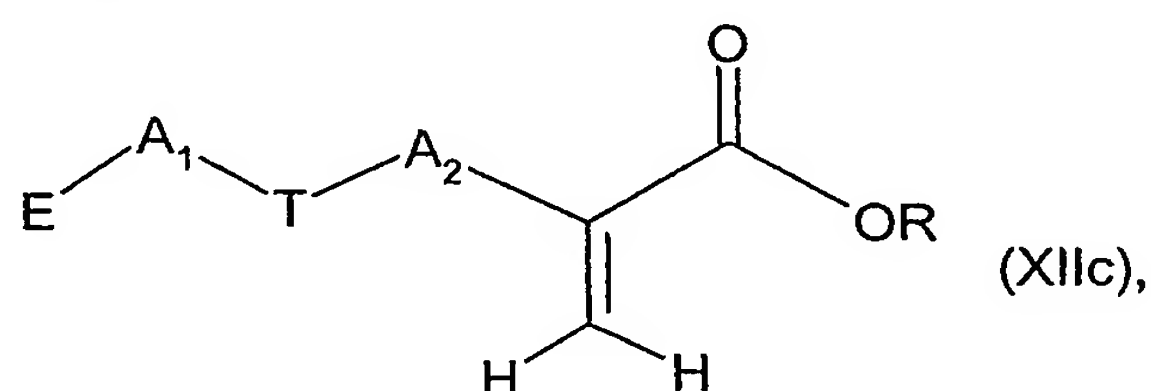
which is known or can be prepared according to methods known *per se*, is reacted in the presence of a base with a compound of formula $R_{41}-C(=O)-R_{51}$, wherein R_{41} and R_{51} are as defined for formula (XIIa), and the resulting compound of formula

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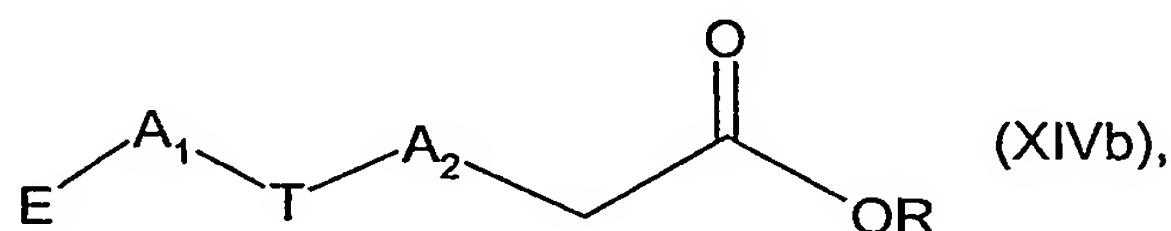


wherein E, T, A₁, A₂, R₄₁ and R₅₁ are as defined for formula (XIIa), is converted according to methods known *per se* into the acid halide of formula (XIIa); and

(I₂) a process for the preparation of a compound of formula

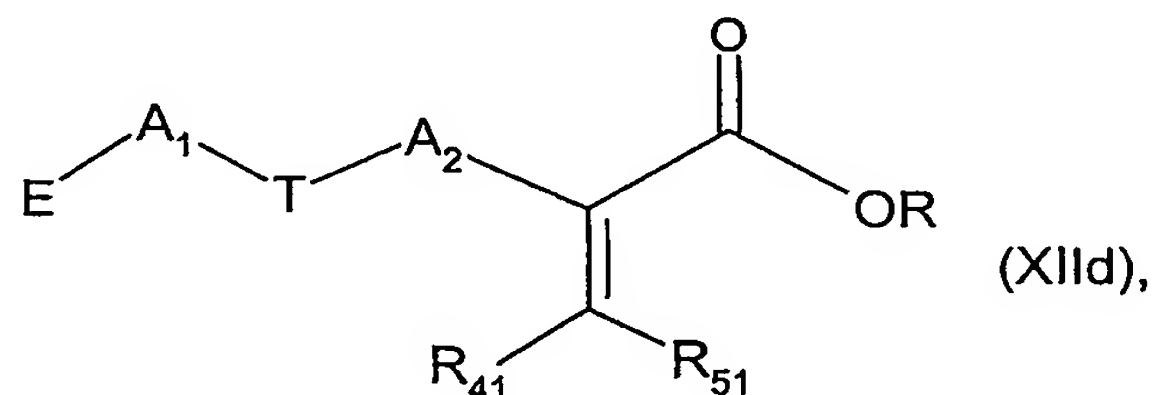


wherein E, T, A₁ and A₂ are as defined for formula (I) and R is C₁-C₆alkyl, wherein a compound of formula



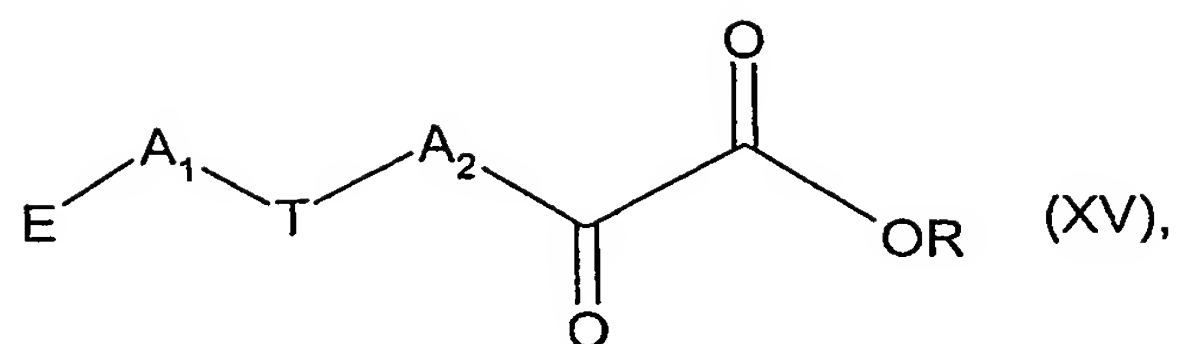
wherein E, T, A₁ and A₂ are as defined for formula (I) and R is C₁-C₆alkyl, is reacted with formaldehyde or paraformaldehyde in the presence of a base, and where appropriate, if desired, the resulting compound of formula (XIIc) may be converted into the corresponding acid halide; and

(I₃) a process for the preparation of a compound of formula



wherein E, T, A₁ and A₂ are as defined for formula (I), R₄₁ and R₄₂ are as defined above for formula (XII) or are halogen, and R is C₁-C₆alkyl, wherein a compound of formula

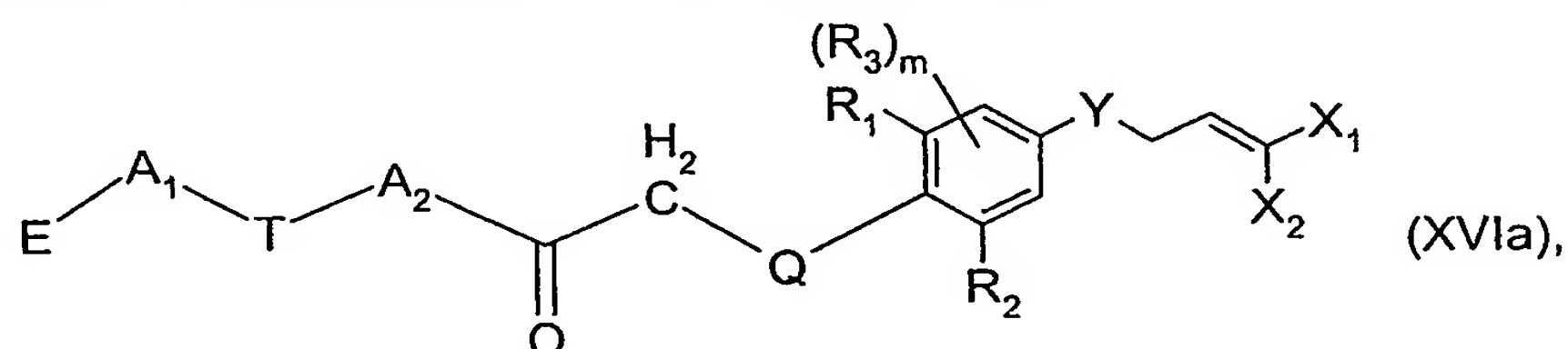
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wherein E, T, A₁, A₂ and R are as defined for formula (XIId), is reacted with a tetrahalomethane in the presence of triphenylphosphine or with an alkyltriphenylphosphonium salt in the presence of a base.

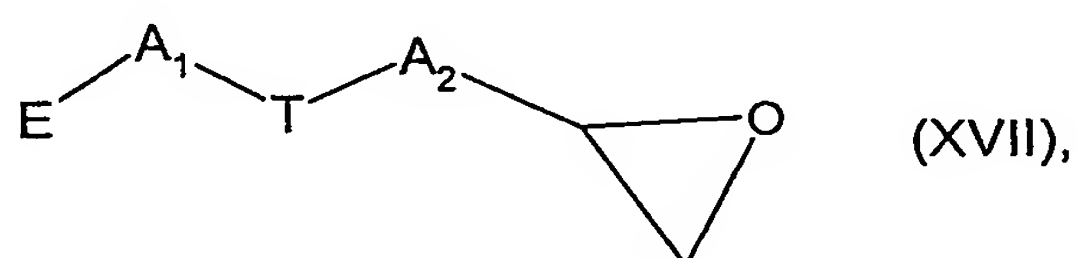
The invention relates also to

(m₁) a process for the preparation of a compound of formula

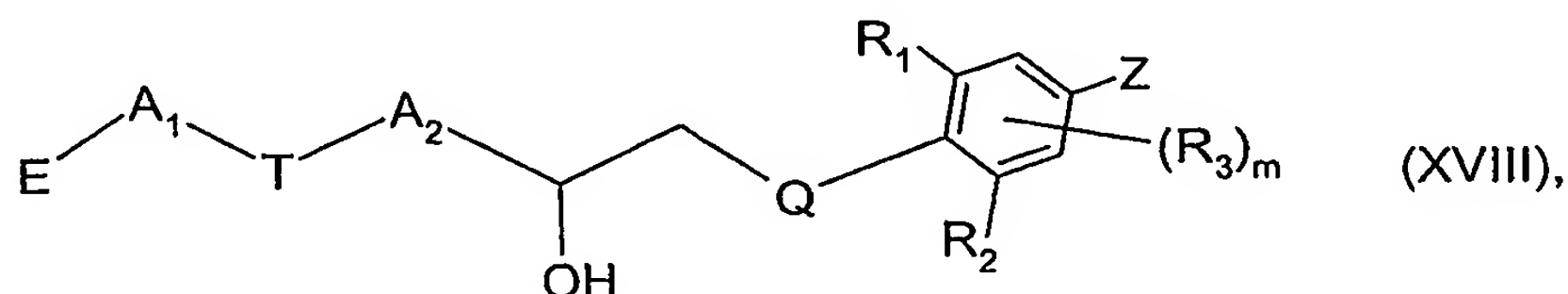


wherein E, T, Q, A₁, A₂, A₃, R₁, R₂, R₃, X₁, X₂, Y and m are as defined for formula (I), wherein either

a compound of formula



is reacted in the presence of a base with a compound of formula (XI) above, and the resulting compound of formula



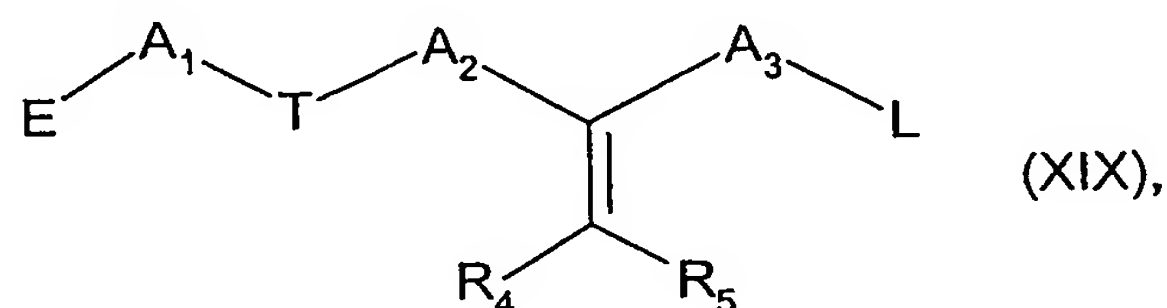
wherein E, T, Q, A₁, A₂, A₃, R₁, R₂, R₃ and m are as defined for formula (I), and Z is one of the radicals Z₁ to Z₆ as defined in formulae (II) to (VII) above, is oxidised, and then reacted further analogously to one or more of process steps (a) to (g); or

(m₂) a compound of formula (XVII) above is reacted with a compound of formula (IX) above, and the resulting compound (compound XVIII) is oxidised analogously to process steps (a) to (g) and analogously to process step (m₁).

The invention relates also to a process for the preparation of a compound of formula (I), wherein W is a bond and A₃ is CH₂, wherein a compound of formula (XVIII) is processed further analogously to one of process steps (I₁) to (I₃) and steps (a) to (g). It will be understood that the process steps (a) to (g) and (I₁) to (I₃) may be carried out in any desired order, that is to say, for example, there are carried out first two steps analogously to steps (a) and (b), then, for example, step (I₂), and subsequently the steps analogously to steps (c) to (g).

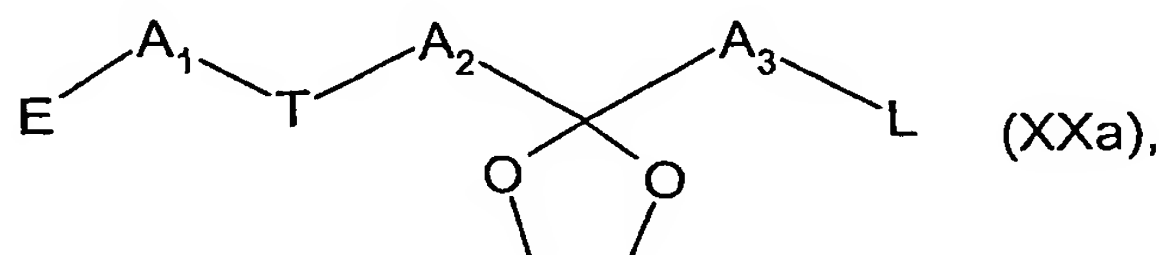
The invention relates also to

(n) a process for the preparation of a compound of formula

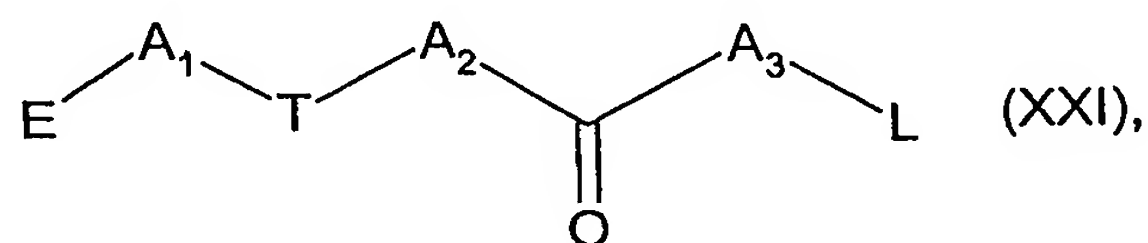


wherein

E, T, A₁, A₂, A₃, R₄ and R₅ are as defined for formula (I) and L is a leaving group, wherein a compound of formula



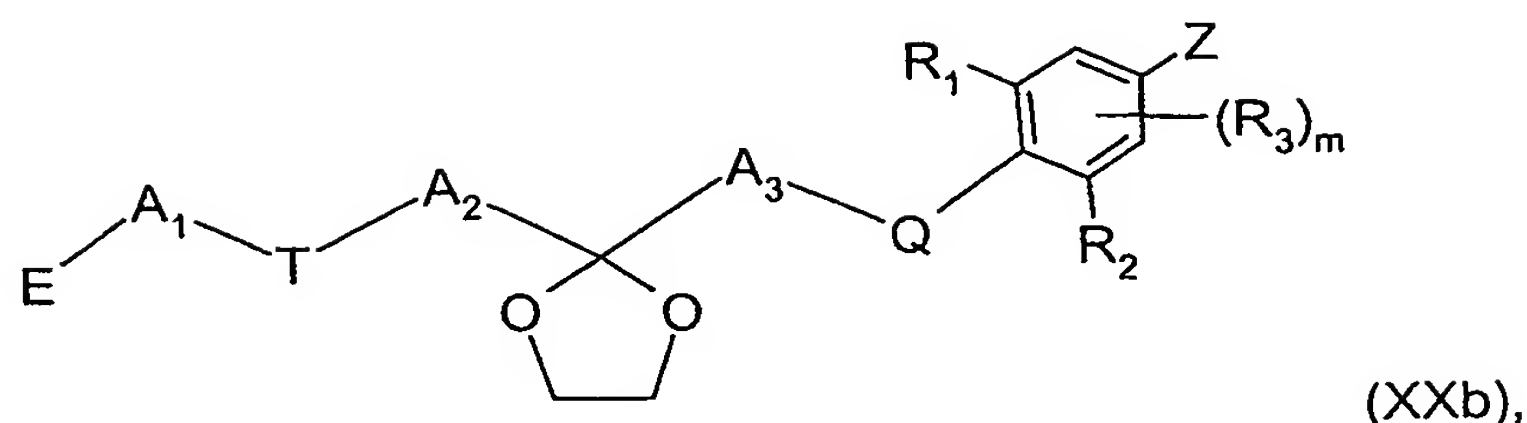
wherein E, T, A₁, A₂ and A₃ are as defined for formula (I) and L is a leaving group, is treated with an acid, and the resulting compound of formula



wherein E, T, A₁, A₂ and A₃ are as defined for formula (I) and L is a leaving group, is reacted further analogously to process step (I₃).

It will be understood that a compound of formula (XXa) may also first be reacted with a compound of formula (IX) or (XI) analogously to process step (h), and the resulting compound of formula

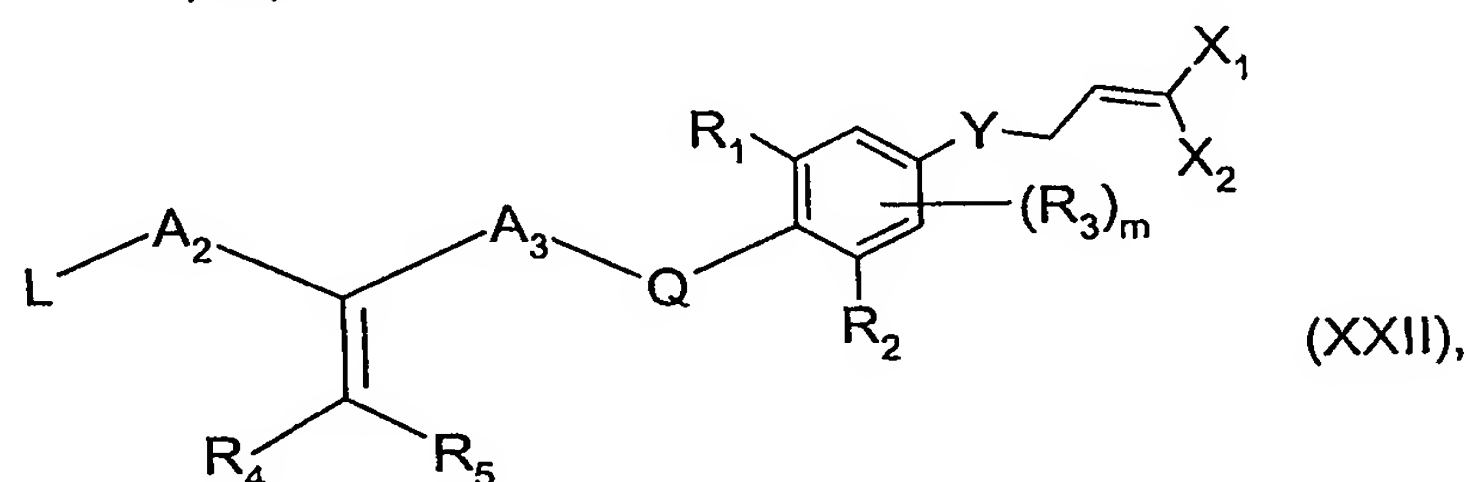
- 17 -



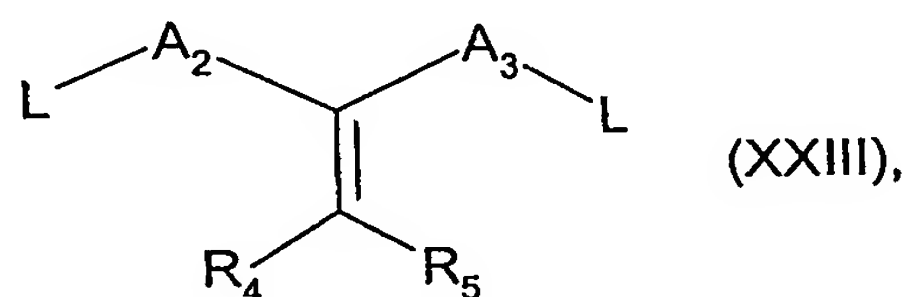
wherein Z has the meanings given above for Z₁ to Z₆ or is the radical -Y-CH=CX₁X₂ defined in formula (I), and E, T, A₁, A₂ and A₃ are as defined for formula (I), and the resulting compound of formula (XXb) may be reacted further, if desired, according to processes (a) to (g) and (n).

The invention relates also to

(o₁) a process for the preparation of a compound of formula

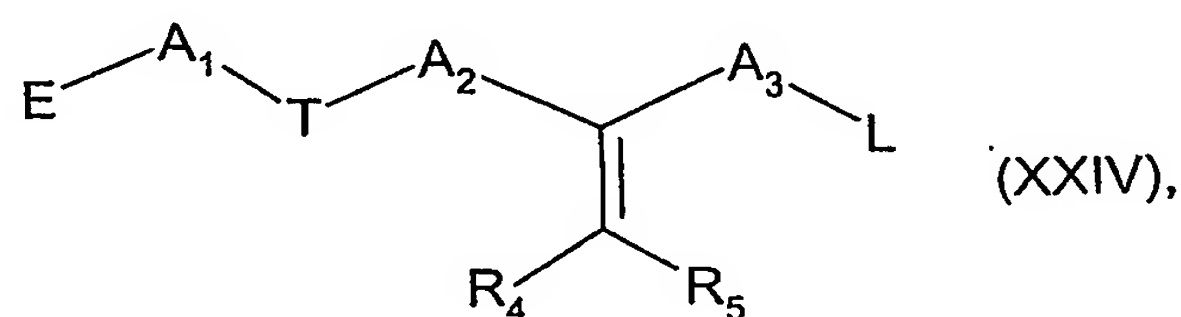


wherein Q, A₂, A₃, R₁, R₂, R₃, X₁, X₂, Y and m are as defined for formula (I) and L is a leaving group, wherein a compound of formula



wherein A₂, A₃, R₄ and R₅ are as defined for formula (I) and the two L groups are leaving groups, is reacted with a compound of formula (IX) or (XI); and

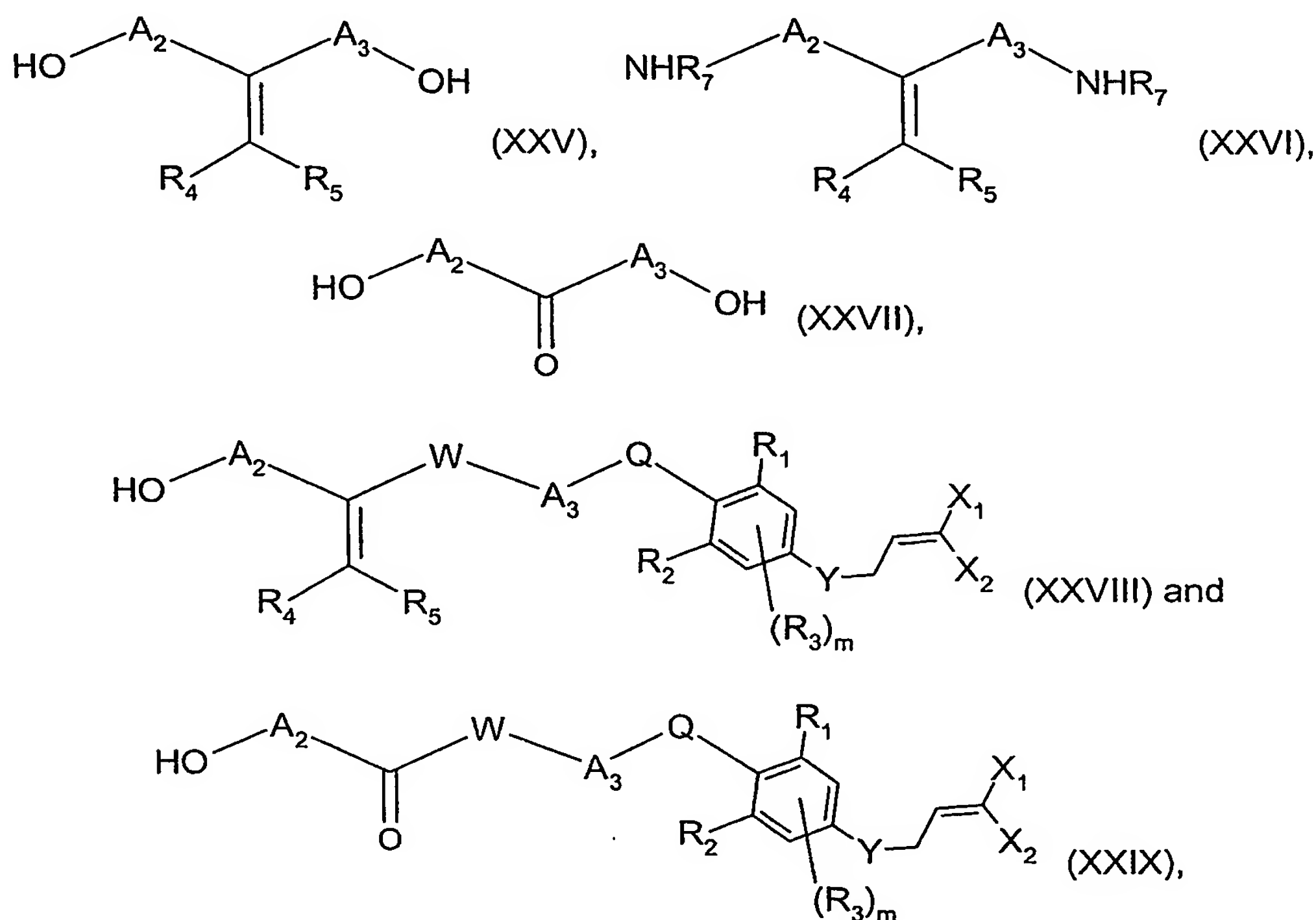
(o₂) a process for the preparation of a compound of formula



wherein E, T, A₁, A₂ and A₃ are as defined for formula (I) and L is a leaving group, wherein a compound of formula (XXIII) above is reacted with a compound of formula E-A₁-T-H, wherein E, A₁ and T are as defined for formula (I).

It will be understood that the processes (n) to (o) according to the invention can also be carried out on any precursor and such a precursor can then be processed in accordance with processes (a) to (m) to form compounds of formula (I). The invention relates also to corresponding intermediates, which are, where novel, the compounds of formulae (II) to (XXIV), in free form or in salt form.

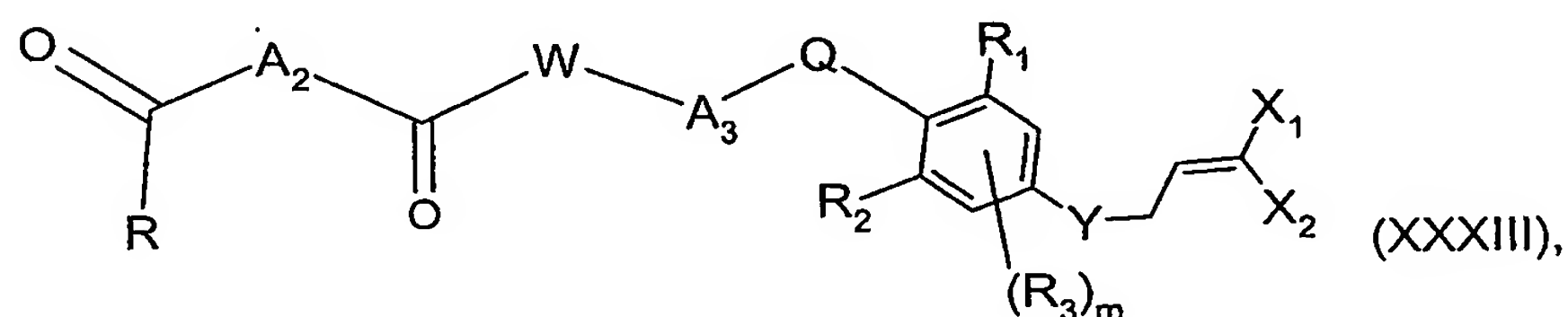
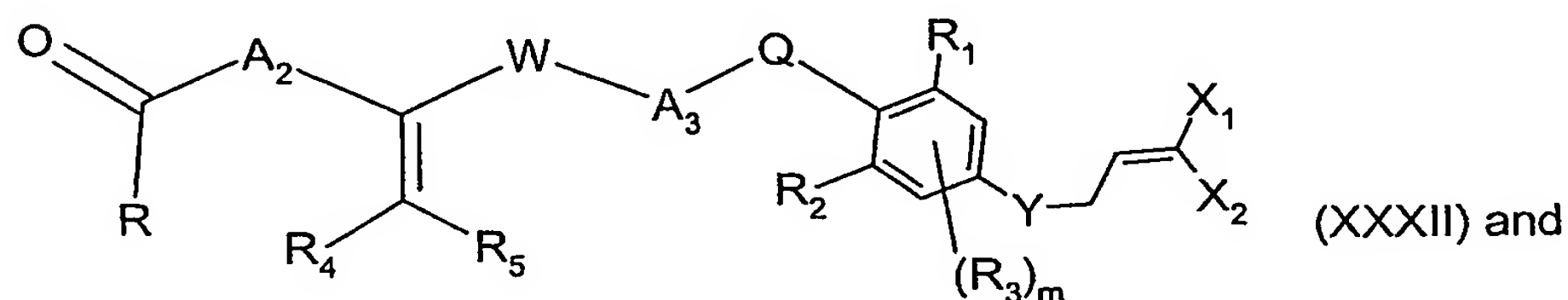
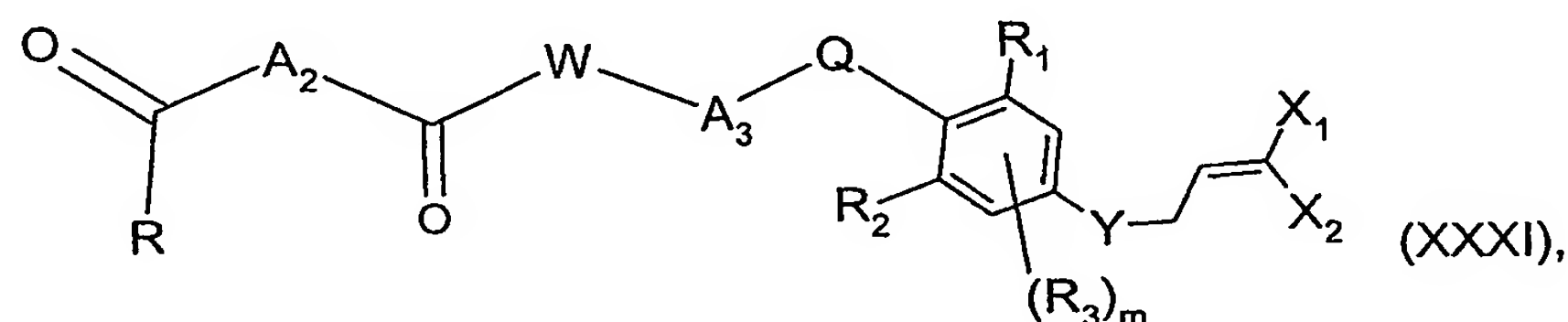
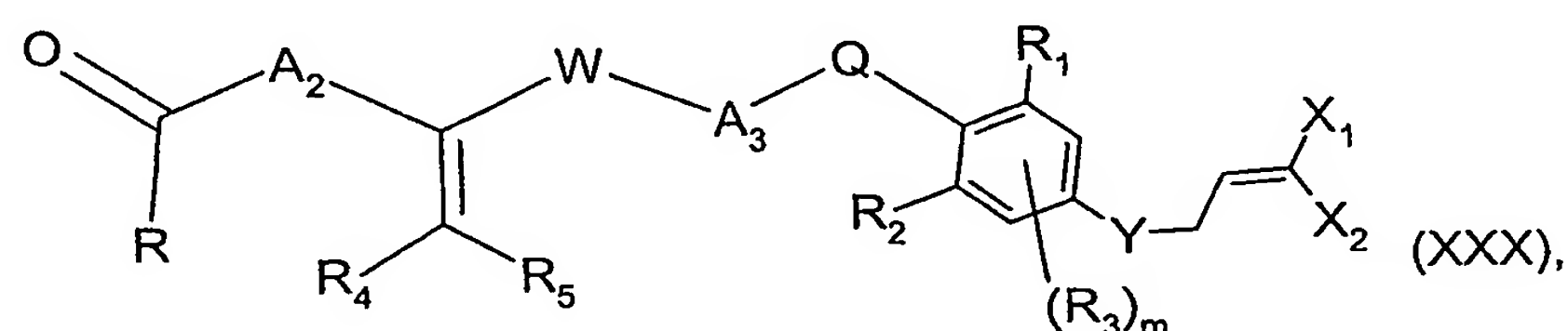
It will also be understood that compounds of formula (I) wherein the bridging members Q, T and W are O, NR₇ or S can be obtained by reacting a starting compound that contains a leaving group at the appropriate position with another starting compound that contains OH, SH or NHR₇ at the position to be bridged. Such starting compounds are, for example, the compounds of formulae (VIII), (XIX), (XXI), (XXII), (XXIII) and (XXIV), some of which are known and some of which are novel. Where novel, the invention relates also to such compounds. Further suitable compounds that are also novel, to which the invention also relates, are, for example, the compounds of formulae



wherein E, T, Q, A₁, A₂, A₃, R₁, R₂, R₃, R₄, R₅, R₇, X₁, X₂, Y and m are as defined for formula (I).

It will also be understood that compounds of formula (I) wherein the bridging members T and W are -C(=O)-O-, -O-C(=O)-, -C(=O)-NR₆- or -NR₆-C(=O)- or -C(R₈)=N-O- can be

prepared from two or more suitable precursors, in which, as, for example, in formula (XII) above, one of the starting materials contains an acid halide or an ester function and the other starting material contains a free OH group to form a bridging function $-C(=O)-O-$ or $-O-C(=O)-$ or contains an $-NR_6-$ group to form an acid amide. Similarly, in order to form a bridging member $-C(R_8)=N-O-$, a starting material that carries an aldehyde or a keto function can be combined with a starting material that carries a hydroxylamine function at the appropriate position. Such preparation processes require, in addition to the above-mentioned compounds of formula (XII), for example, intermediates of the following formulae:



wherein E , T , Q , A_1 , A_2 , A_3 , R_1 , R_2 , R_3 , R_4 , R_5 , R_7 , X_1 , X_2 , Y and m are as defined for formula (I) and R is alkoxy or halogen.

Similarly, for the preparation of compounds of formula (I) there can also be used intermediates such as those of formulae (XXVIII) to (XXXIII) above, in which, however, the radical $-Y-CH_2-CH=CX_1X_2$ has been replaced by a radical Z_1 to Z_6 . The invention relates also to such compounds.

For intermediates of formulae (II) to (XXXIII) the same preferred meanings apply as those defined for the compounds of formula (I) under (2) to (11).

The reactions described hereinabove and hereinbelow are carried out in a manner known *per se*, for example in the absence or, if necessary, in the presence of a suitable solvent or diluent or of a mixture thereof, the reactions being carried out, as required, with cooling, at room temperature or with heating, for example in a temperature range of approximately from -80°C to the boiling temperature of the reaction mixture, preferably from approximately -20°C to approximately +150°C, and, if necessary, in a closed vessel, under pressure, under an inert gas atmosphere and/or under anhydrous conditions. Especially advantageous reaction conditions can be found in the Examples.

A leaving group, for example the leaving groups L defined above, or a counter-ion is to be understood hereinbefore and hereinbelow as being any removable group that customarily comes into consideration for chemical reactions, such as are known to the person skilled in the art; especially OH, halogens, such as fluorine, chlorine, bromine, iodine, -O-Si(C₁-C₈alkyl)₃, -O-aryl, -S-(C₁-C₈alkyl), -S-aryl, -O-S(=O)₂U, -S(=O)U or -S(=O)₂U, wherein U is unsubstituted or substituted C₁-C₈alkyl, C₂-C₈alkenyl, C₂-C₈alkynyl, unsubstituted or substituted aryl or unsubstituted or substituted benzyl. Especially preferred as a leaving group are chlorine or bromine, mesylate, triflate, tosylate, especially chlorine; or chloride or bromide, especially chloride.

Process (a): The reaction is carried out in acetic acid or a halogenated hydrocarbon, such as dichloromethane, at temperatures of from -20°C to 100°C, preferably at from 20°C to 50°C. As oxidising agents there are used, for example, hydrogen peroxide, a peracid, such as peracetic acid, trifluoroperacetic acid, 3-chloroperbenzoic acid or a mixture, such as sodium perborate in acetic acid.

Process (b): The reaction is preferably carried out in an alcohol, such as methanol, ethanol or an alcohol/water mixture, in the presence of an inorganic base, such as NaOH or KOH, and at temperatures of from 0°C to 150°C, preferably from 20°C to 80°C. Alternatively aminolysis with a primary amine, such as n-butylamine, can be carried out in a hydrocarbon, such as toluene or benzene, at temperatures of from 0°C to 150°C, preferably at from 20°C to 80°C.

Process (c): Depending upon the nature of the benzyl substituent to be removed, the reaction can be carried out, for example, under a hydrogen atmosphere, at from 1 to 150 bar, especially at from 1 to 20 bar, and with the addition of a catalyst, such as palladium-

on-carbon, in an alcohol or ether. The preferred reaction temperature is from 0°C to 120°C, especially from 20°C to 80°C.

Processes (d) and (g): The reaction is preferably carried out in the presence of a base, such as potassium or sodium carbonate, in acetone or dimethylformamide, at temperatures of from 0°C to 150°C, preferably from 20°C to 80°C. If necessary, catalytic amounts of potassium iodide or sodium iodide, or phase transfer catalysts, such as crown ethers or quaternary ammonium salts, are added.

Process (e): The reaction is preferably carried out in acetone, dichloromethane, acetic acid, or especially in water, optionally with the addition of a mineral acid, at temperatures of from 0°C to 120°C, preferably at from 20°C to 50°C. For complete cleavage of the acetal it is preferable to add a strong mineral acid, for example hydrochloric acid, sulfuric acid or 4-toluenesulfonic acid.

Process (f): For the preparation of the difluoro-, dichloro-, dibromo-, chlorofluoro- and bromofluoro-vinyl compounds, reaction with CCl_4 , CBr_4 , CF_2X_2 , CFX_3 , $\text{CF}_2\text{XC}(=\text{O})\text{ONa}$ or $\text{CFX}_2\text{C}(=\text{O})\text{ONa}$ wherein X is bromine or chlorine is carried out in the presence of a trialkyl- or triaryl-phosphine, optionally with the addition of powdered zinc. The reaction is carried out in an inert solvent such as, for example, benzene or toluene, or an ether, such as diethyl ether, diisopropyl ether, dioxane or tetrahydrofuran, at temperatures of from 0°C to 150°C, preferably at from 20°C to 80°C.

For the preparation of the dichlorovinyl compounds it is also possible for the process to be carried out in dimethylformamide, benzene, toluene, or in an ether, at temperatures of from 0°C to 120°C, preferably from 20°C to 80°C, and in the presence of trichloroacetic acid/sodium trichloroacetate, then by addition of acetic anhydride, optionally with the addition of base, for example triethylamine, and finally by addition of zinc and acetic acid.

Processes (h) and (i): The reaction is preferably carried out in an ether or an amide, such as dimethylformamide, dimethylacetamide or N-methylpyrrolidone, at temperatures of from 0°C to 150°C, preferably at from 20°C to 80°C, with the addition of a base, such as potassium or sodium carbonate. Alternatively a coupling reagent, for example azodicarboxylic acid diethyl or diisopropyl ester and triphenylphosphine, can be used.

Process (k): The reaction is preferably carried out in a halogenated hydrocarbon, such as methylene chloride, or in an ether, such as dioxane or tetrahydrofuran, at temperatures of

from 0°C to 120°C, especially at from 20°C to 80°C, with the addition of a base, for example triethylamine or ethyldiisopropylamine.

Processes (l₁), (l₂): The reaction may be carried out, on the one hand, in an alcohol, such as methanol or ethanol, in dimethylformamide, N-methylpyrrolidone or tetrahydrofuran as solvent, in the presence of a base, such as diethylamine, diisopropylamine, piperidine, KOH, NaOH or sodium methylate, at a temperature of from -70°C to the boiling temperature of the solvent; or, on the other hand, for example, the reaction may be carried out in acetic acid at from 20°C to 120°C in the presence of ammonium acetate.

Process (l₃): The reaction is preferably carried out in an ether, such as dioxane, tetrahydrofuran or dimethoxyethane, or in an aromatic solvent, such as toluene or xylene, at temperatures of from 0°C to 150°C, especially at from 20°C to 100°C, with the addition of a base, such as potassium or sodium carbonate, potassium tert-butyrate or butyllithium.

Process (m): The reaction is preferably carried out in an ether, such as dioxane, tetrahydrofuran or dimethoxyethane, in an amide, such as dimethylformamide, dimethylacetamide or N-methylpyrrolidone, in an aromatic solvent, such as toluene or xylene, or in a nitrile, such as acetonitrile, at temperatures of from 0°C to 150°C, preferably from 20°C to 100°C, with the addition of a base, such as triethylamine or ethyldiisopropylamine.

Processes (n) and (o): The reaction is preferably carried out in an ether, such as dioxane, tetrahydrofuran or dimethoxyethane, in an amide, such as dimethylformamide, dimethylacetamide or N-methylpyrrolidone, or in a nitrile, such as acetonitrile, at temperatures of from 0°C to 150°C, preferably from 20°C to 100°C, with the addition of a base, such as potassium or sodium carbonate.

Especially preferred process conditions can be found in the Examples. The invention relates especially to the preparation processes described in Examples P1 to P11.

Compounds of formula (I) obtainable in accordance with the process or by other means can be converted into other compounds of formula (I) in a manner known *per se* by replacement of one or more substituents in the starting compound of formula (I) in customary manner by another (other) substituent(s) according to the invention.

In the case of such replacement, depending upon the choice of reaction conditions and starting materials suitable therefor, it is possible for only one substituent to be replaced by another substituent according to the invention in a reaction step or for a plurality of substit-

uents to be replaced by other substituents according to the invention in the same reaction step.

Salts of compounds of formula (I) can be prepared in a manner known *per se*. For example, salts of compounds of formula (I) with bases are obtained by treatment of the free compounds with a suitable base or with a suitable ion exchange reagent.

Salts of compounds of formula (I) can be converted into the free compounds of formula (I) in customary manner, for example by treatment with a suitable acid or with a suitable ion exchange reagent.

Salts of compounds of formula (I) can be converted in a manner known *per se* into other salts of a compound of formula (I).

The compounds of formula (I), in free form or in salt form, may be in the form of one of the possible isomers or in the form of a mixture thereof, for example, depending upon the number of asymmetric carbon atoms occurring in the molecule and their absolute and relative configuration, and/or depending upon the configuration of non-aromatic double bonds occurring in the molecule, in the form of pure isomers, such as enantiomers and/or diastereoisomers, or in the form of mixtures of isomers, such as mixtures of enantiomers, for example racemates, mixtures of diastereoisomers or mixtures of racemates. The invention relates both to the pure isomers and to all possible mixtures of isomers and is to be interpreted as such hereinbefore and hereinafter, even if stereochemical details are not mentioned specifically in every case.

Mixtures of diastereoisomers, mixtures of racemates and mixtures of double bond isomers of compounds of formula (I), in free form or in salt form, that are obtainable by the process according to the invention – depending upon the starting materials and procedures chosen – or by some other method, can be separated into the pure diastereoisomers or racemates in known manner on the basis of the physico-chemical differences between the constituents, for example by means of fractional crystallisation, distillation and/or chromatography.

Mixtures of enantiomers, such as racemates, that are obtainable in a corresponding manner can be resolved into the enantiomers by known methods, for example by recrystallisation from an optically active solvent, by chromatography on chiral adsorbents, for example high pressure liquid chromatography (HPLC) on acetylcellulose, with the aid of suitable microorganisms, by cleavage with specific, immobilised enzymes, *via* the formation of

inclusion compounds, for example using chiral crown ethers, only one enantiomer being complexed, or by conversion into diastereoisomeric salts and separation of the mixture of diastereoisomers so obtained, for example on the basis of their different solubilities by fractional crystallisation, into the diastereoisomers, from which the desired enantiomer can be freed by the action of suitable agents.

Apart from by separation of corresponding mixtures of isomers, it is also possible for pure diastereoisomers or enantiomers to be obtained according to the invention by generally known methods of diastereoselective or enantioselective synthesis, for example by carrying out the process according to the invention using starting materials having correspondingly suitable stereochemistry.

In each case it is advantageous to isolate or synthesize the biologically more active isomer, e.g. enantiomer or diastereoisomer, or mixture of isomers, e.g. mixture of enantiomers or mixture of diastereoisomers, where the individual components have different biological activity.

The compounds of formula (I), in free form or salt form, can also be obtained in the form of their hydrates and/or may include other solvents, for example solvents which may have been used for the crystallisation of compounds present in solid form.

The invention relates to all those embodiments of the process according to which a compound obtainable as starting material or intermediate at any stage of the process is used as starting material and some or all of the remaining steps are carried out or a starting material is used in the form of a derivative or salt and/or its racemates or enantiomers or, especially, is formed under the reaction conditions.

In the process of the present invention it is preferable to use those starting materials and intermediates, in each case in free form or in salt form, which result in the compounds of formula (I) and their salts described at the beginning as being especially valuable.

In the area of pest control, the compounds of formula (I) according to the invention are active ingredients exhibiting valuable preventive and/or curative activity with a very advantageous biocidal spectrum even at low rates of concentration, while being well tolerated by warm-blooded animals, fish and plants. The active ingredients according to the invention are effective against all or individual development stages of normally sensitive animal pests, but also of resistant animal pests, such as insects and members of the order Acarina. The insecticidal or acaricidal activity of the active ingredients according to the invention may

manifest itself directly, i.e. in the mortality of the pests, which occurs immediately or only after some time, for example during moulting, or indirectly, for example in reduced oviposition and/or hatching rate, good activity corresponding to a mortality of at least 50 to 60 %.

Successful control within the scope of the subject of the invention is possible, in particular, of pests from the orders Lepidoptera, Coleoptera, Orthoptera, Isoptera, Psocoptera, Anoplura, Mallophaga, Thysanoptera, Heteroptera, Homoptera, Hymenoptera, Diptera, Siphonaptera, Thysanura and Acarina, mainly Lepidoptera and Coleoptera. Very especially good control is possible of the following pests: *Abagrotis* spp., *Abraxas* spp., *Acantholeucania* spp., *Acanthoplusia* spp., *Acarus* spp., *Acarus siro*, *Aceria* spp., *Aceria sheldoni*, *Acleris* spp., *Acoloithus* spp., *Acompsia* spp., *Acosus* spp., *Acria* spp., *Acrobasis* spp., *Acrocercops* spp., *Acrolepia* spp., *Acrolepiopsis* spp., *Acronicta* spp., *Acropolitis* spp., *Actebia* spp., *Aculus* spp., *Aculus schlechtendali*, *Adoxophyes* spp., *Adoxophyes reticulana*, *Aedes* spp., *Aegeria* spp., *Aethes* spp., *Agapeta* spp., *Agonopterix* spp., *Agriopis* spp., *Agriotes* spp., *Agriphila* spp., *Agrochola* spp., *Agroperina* spp., *Alabama* spp., *Alabama argillaceae*, *Agrotis* spp., *Albuna* spp., *Alcathoe* spp., *Alcis* spp., *Aleimma* spp., *Aletia* spp., *Aleurothrixus* spp., *Aleurothrixus floccosus*, *Aleyrodes* spp., *Aleyrodes brassicae*, *Allophyes* spp., *Alsophila* spp., *Amata* spp., *Amathes* spp., *Amblyomma* spp., *Amblyptilia* spp., *Ammoconia* spp., *Amorbia* spp., *Amphion* spp., *Amphipoea* spp., *Amphipyra* spp., *Amyelois* spp., *Anacamptodes* spp., *Anagrapha* spp., *Anarsia* spp., *Anatrychyntis* spp., *Anavitrinella* spp., *Ancylis* spp., *Andropolia* spp., *Anhimella* spp., *Antheraea* spp., *Antherigona* spp., *Antherigona soccata*, *Anthonomus* spp., *Anthonomus grandis*, *Anticarsia* spp., *Anticarsia gemmatalis*, *Aonidiella* spp., *Apamea* spp., *Aphania* spp., *Aphelia* spp., *Aphididae*, *Aphis* spp., *Apotomis* spp., *Aproaerema* spp., *Archippus* spp., *Archips* spp., *Acromyrmex*, *Arctia* spp., *Argas* spp., *Argolamprotes* spp., *Argyresthia* spp., *Argyrogramma* spp., *Argyroplote* spp., *Argyrotaenia* spp., *Arotrophora* spp., *Ascotis* spp., *Aspidiotus* spp., *Aspilapteryx* spp., *Asthenoptycha* spp., *Aterpia* spp., *Athetis* spp., *Atomaria* spp., *Atomaria linearis*, *Atta* spp., *Atypha* spp., *Autographa* spp., *Axylia* spp., *Bactra* spp., *Barbara* spp., *Batrachedra* spp., *Battaristis* spp., *Bembecia* spp., *Bemisia* spp., *Bemisia tabaci*, *Bibio* spp., *Bibio hortulanis*, *Bisigna* spp., *Blastesthia* spp., *Blatta* spp., *Blatella* spp., *Blepharosis* spp., *Bleptina* spp., *Boarmia* spp., *Bombyx* spp., *Bomolocha* spp., *Boophilus* spp., *Brachmia* spp., *Bradina* spp., *Brevipalpus* spp., *Brithys* spp., *Bryobia* spp., *Bryobia praetiosa*, *Bryotropha* spp., *Bupalus* spp., *Busseola* spp., *Busseola fusca*, *Cabera* spp., *Cacoecimorpha* spp., *Cadra* spp., *Cadra cautella*, *Caenurgina* spp., *Calipitimerus* spp., *Callierges* spp., *Callophora* spp.,

Callophora erythrocephala, Calophasia spp., Caloptilia spp., Calybites spp., Capnoptycha
 spp., Capua spp., Caradrina spp., Caripeta spp., Carmenta spp., Carposina spp., Carposina
 nipponensis, Catamacta spp., Catelaphris spp., Catoptria spp., Caustoloma spp., Celaena
 spp., Celypha spp., Cenopsis spp., Cephus spp., Ceramica spp., Cerapteryx spp., Ceratitis
 spp., Ceratophyllus spp., Ceroplaster spp., Chaetocnema spp., Chaetocnema tibialis,
 Chamaesphecia spp., Charanvca spp., Cheimophila spp., Chersotis spp., Chiasmia spp.,
 Chilo spp., Chionodes spp., Chorioptes spp., Choristoneura spp., Chrysaspidia spp.,
 Chrysodeixis spp., Chrysomya spp., Chrysomphalus spp., Chrysomphalus dictyospermi,
 Chrysomphalus aonidium, Chrysoteuchia spp., Cilix spp., Cimex spp., Clysia spp., Clysia
 ambiguella, Clepsis spp., Cnaemidophorus spp., Cnaphalocrocis spp., Cnephasia spp.,
 Coccus spp., Coccus hesperidum, Cochylis spp., Coleophora spp., Colotois spp.,
 Commophila spp., Conistra spp., Conopomorpha spp., Corcyra spp., Cornutiplusia spp.,
 Cosmia spp., Cosmopolites spp., Cosmopterix spp., Cossus spp., Costaeonvexa spp.,
 Crambus spp., Creatonotos spp., Crocidolomia spp., Crocidolomia binotalis, Croesia spp.,
 Crymodes spp., Cryptasasma spp., Cryptoblabe spp., Cryptocala spp., Cryptophlebia
 spp., Cryptophlebia leucotreta, Cryptoptila spp., Ctenopseustis spp., Cucullia spp., Curculio
 spp., Culex spp., Cuterebra spp., Cydia spp., Cydia pomonella, Cymbalophora spp.,
 Dactylethra spp., Dacus spp., Dadica spp., Damalinae spp., Dasychira spp., Decadarchis
 spp., Decodes spp., Deilephila spp., Deltodes spp., Dendrolimus spp., Depressaria spp.,
 Dermestes spp., Dermanyssus spp., Dermanyssus gallinae, Diabrotica spp., Diachrysia
 spp., Diaphania spp., Diarsia spp., Diasemia spp., Diatraea spp., Diceratura spp., Dicho-
 meris spp., Dichrocrocis spp., Dichrorampha spp., Dicycla spp., Dioryctria spp., Diparopsis
 spp., Diparopsis castanea, Dipleurina spp., Diprion spp., Diprionidae, Discestra spp., Distan-
 tiella spp., Distantiella theobroma, Ditula spp., Diurnea spp., Doratopteryx spp., Drepana
 spp., Drosophila spp., Drosophila melanogaster, Dysauxes spp., Dysdercus spp., Dysstroma
 spp., Eana spp., Earias spp., Ecclitica spp., Ecdytolopha spp., Ecpyrrhorhoe spp., Ecto-
 myeloides spp., Eetropis spp., Egira spp., Elasmopalpus spp., Emmelia spp., mpoasca spp.,
 Empyreuma spp., Enargia spp., Enarmonia spp., Endopiza spp., Endothenia spp., Endo-
 tricha spp., Eoreuma spp., Eotetranychus spp., Eotetranychus carpini, Epagoge spp., Epelis
 spp., Ephestia spp., Ephestiodes spp., Epiblema spp., Epiehoristodes spp., Epinotia spp.,
 Epiphyas spp., Epiblema spp., Epipsestis spp., Epirrhoe spp., Episimus spp., Epitymbia
 spp., Epillachna spp., Erannis spp., Erastria spp., Eremnus spp., Ereunetis spp., Eriophyes
 spp., Eriosoma spp., Eriosoma lanigerum, Erythroneura spp., Estigmene spp., Ethmia spp.,
 Etiella spp., Euagrotis spp., Eucosma spp., Euehlaena spp., Euelidia spp., Eueosma spp.,

Euchistus spp., Eucosmomorpha spp., Eudonia spp., Eufidonia spp., Euhyponomeutoides spp., Eulepisodes spp., Eulia spp., Eulithis spp., Eupithecia spp., Euplexia spp., Eupoecilia spp., Eupoecilia ambiguella, Euproctis spp., Eupsilia spp., Eurhodope spp., Eurois spp., Eurygaster spp., Eurythmia spp., Eustrotia spp., Euxoa spp., Euzophera spp., Evergestis spp., Evippe spp., Exartema spp., Fannia spp., Faronta spp., Feltia spp., Filatima spp., Fishia spp., Frankliniella spp., Fumibotys spp., Gaesa spp., Gascardia spp., Gastrophilus spp., Gelechia spp., Gilpinia spp., Gilpinia polytoma, Glossina spp., Glyphipterix spp., Glyphodes spp., Gnorimoschemini spp., Gonodonta spp., Gortyna spp., Gracillaria spp., Graphania spp., Grapholita spp., Grapholitha spp., Gravarmata spp., Gretchena spp., Griselda spp., Gryllotalpa spp., Gynaephora spp., Gypsonoma spp., Hada spp., Haematopinus spp., Halisidota spp., Harpieteryx spp., Harrisina spp., Hedyia spp., Helicoverpa spp., Heliophobus spp., Heliothis spp., Hellula spp., Helotropa spp., Hemaris spp., Hercinothrips spp., Herculia spp., Hermonassa spp., Heterogenea spp., Holomelina spp., Homadaula spp., Homoeosoma spp., Homoglaea spp., Homohadena spp., Homona spp., Homonopsis spp., Hoplocampa spp., Hoplodrina spp., Hoshinoa spp., Hxalomma spp., Hydraecia spp., Hydriomena spp., Hyles spp., Hyloicus spp., Hypagyrtis spp., Hypatima spp., Hyphantria spp., Hyphantria cunea, Hypocala spp., Hypocoena spp., Hypodema spp., Hyppobosca spp., Hypsipyla spp., Hyssia spp., Hysterosia spp., Idaea spp., Idia spp., Ipimorpha spp., Isia spp., Isochorista spp., Isophrictis spp., Isopolia spp., Isotrias spp., Ixodes spp., Itame spp., Jodia spp., Jodis spp., Kawabea spp., Keiferia spp., Keiferia lycopersicella, Labdia spp., Lacini-
polia spp., Lambdina spp., Lamprothripa spp., Laodelphax spp., Lasius spp., Laspeyresia spp., Leptinotarsa spp., Leptinotarsa decemlineata, Leptocorisa spp., Leptostales spp., Lecanium spp., Lecanium comi, Lepidosaphes spp., Lepisma spp., Lepisma saccharina , Lesmone spp., Leucania spp., Leucinodes spp., Leucophaea spp., Leucophaea maderae, Leucoptera spp., Leucoptera scitella, Linognathus spp., Liposcelis spp., Lissorhoptrus spp., Lithacodia spp., Lithocolletis spp., Lithomoia spp., Lithophane spp., Lixodessa spp., Lobesia spp., Lobesia botrana, Lobophora spp., Locusta spp., Lomanaltes spp., Lomographa spp., Loxagrotis spp., Loxostege spp., Lucilia spp., Lymantria spp., Lymnaecia spp., Lyonetia spp., Lyriomyza spp., Macdonnoughia spp., Macrauzata spp., Macro-noctua spp., Macro-siphus spp., Malacosoma spp., Maliarpha spp., Mamestra spp., Mamestra brassicae, Manduca spp., Manduca sexta, Marasmia spp., Margaritia spp., Matratinea spp., Matsumuraeses spp., Melanagromyza spp., Melipotes spp., Melissopus spp., Melittia spp., Melolontha spp., Meristis spp., Meritastis spp., Merophyas spp., Mesapamea spp., Mesogona spp., Mesoleuca spp., Metanema spp., Metendothenia spp., Metzneria spp., Micardia spp., Micro-

corses spp., Microleon spp., Mnesictena spp., Mocis spp., Monima spp., Monochroa spp., Monomorium spp., Monomorium pharaonis, Monopsis spp., Morrisonia spp., Musca spp., Mutuuraia spp., Myelois spp., Mythimna spp., Myzus spp., Naranga spp., Nedra spp., Nemapogon spp., Neodiprion spp., Neosphaleroptera spp., Nephelodes spp., Nephrotettix spp., Nezara spp., Nilaparvata spp., Niphonympha spp., Nippoptilia spp., Noctua spp., Nola spp., Notocelia spp., Notodonta spp., Nudaurelia spp., Ochropleura spp., Ocnerostoma spp., Oestrus spp., Olethreutes spp., Oligia spp., Olindia spp., Olygonychus spp., Olygonychus gallinae, Oncocnemis spp., Operophtera spp., Ophisma spp., Opogona spp., Oraesia spp., Orniodoros spp., Orgyia spp., Oria spp., Orseolia spp., Orthodes spp., Orthogonia spp., Orthosia spp., Oryzaephilus spp., Oscinella spp., Oscinella frit, Osminia spp., Ostrinia spp., Ostrinia nubilalis, Otiorhynchus spp., Ourapteryx spp., Pachetra spp., Pachysphinx spp., Pagyda spp., Paleacrita spp., Paliga spp., Palthis spp., Pammene spp., Pandemis spp., Panemeria spp., Panolis spp., Panolis flammea, Panonychus spp., Parargyresthia spp., Paradiarsia spp., Paralobesia spp., Paranthrene spp., Parapandemis spp., Parapediasia spp., Parastichtis spp., Parasyndemis spp., Paratoria spp., Pareromeme spp., Pectinophora spp., Pectinophora gossypiella, Pediculus spp., Pegomyia spp., Pegomyia hyoscyami, Pelochrista spp., Pennisetia spp., Penstemonia spp., Pemphigus spp., Peribatodes spp., Peridroma spp., Perileucoptera spp., Periplaneta spp., Perizoma spp., Petrova spp., Plexicopia spp., Phalonia spp., Phalonidia spp., Phaneta spp., Phlyctaenia spp., Phlyctinus spp., Phorbia spp., Phragmatobia spp., Phricanthes spp., Phthorimaea spp., Phthorimaea operculella, Phyllocnistis spp., Phyllocoptruta spp., Phyllocoptruta oleivora, Phyllonorycter spp., Phyllophila spp., Phylloxera spp., Pieris spp., Pieris rapae, Piesma spp., Planococcus spp., Planotortrix spp., Platyedra spp., Platynota spp., Platyptilia spp., Platysenta spp., Plodia spp., Plusia spp., Plutella spp., Plutella xylostella, Podosesia spp., Polia spp., Popillia spp., Polymixis spp., Polyphagotarsonemus spp., Polyphagotarsonemus latus, Prays spp., Prionoxystus spp., Probole spp., Proceras spp., Prochoerodes spp., Proeulia spp., Proschistis spp., Proselena spp., Proserpinus spp., Protagrotis spp., Proteoteras spp., Protobathra spp., Protoschinia spp., Pselnophorus spp., Pseudaletia spp., Pseudanthonomus spp., Pseudaternelia spp., Pseudaulacaspis spp., Pseudexentera spp., Pseudococcus spp., Pseudohermenias spp., Pseudoplusia spp., Psoroptes spp., Psylla spp., Psylliodes spp., Pterophorus spp., Ptycholoma spp., Pulvinaria spp., Pulvinaria aethiopica, Pyralis spp., Pyrausta spp., Pyrgotis spp., Pyrreferra spp., Pyrrharctia spp., Quadraspidiotus spp., Rancora spp., Raphia spp., Reticulitermes spp., Retinia spp., Rhagoietis spp., Rhagoietis pomonella, Rhipicephalus spp., Rhizoglyphus spp., Rhizopertha spp., Rhodnius spp., Rhopha-

Iosiphum spp., *Rhopobota* spp., *Rhyacia* spp., *Rhyacionia* spp., *Rhynchopacha* spp., *Rhyzosthenes* spp., *Rivula* spp., *Rondotia* spp., *Rusidrina* spp., *Rynchaglaea* spp., *Sabulodes* spp., *Sahlbergella* spp., *Sahlbergella singularis*, *Saissetia* spp., *Samia* spp., *Sannina* spp., *Sanninoidea* spp., *Saphoideus* spp., *Sarcoptes* spp., *Sathrobota* spp., *Scarabeidae*, *Sceloides* spp., *Schinia* spp., *Schistocerca* spp., *Schizaphis* spp., *Schizura* spp., *Schreckensteinia* spp., *Sciara* spp., *Scirpophaga* spp., *Scirthrips auranti*, *Scoparia* spp., *Scopula* spp., *Scotia* spp., *Scotinophara* spp., *Scotogramma* spp., *Scrobipalpa* spp., *Scrobipalpopsis* spp., *Semiothisa* spp., *Sereda* spp., *Sesamia* spp., *Sesia* spp., *Sicya* spp., *Sideridis* spp., *Simyra* spp., *Sineugraphe* spp., *Sitochroa* spp., *Sitobion* spp., *Sitophilus* spp., *Sitotroga* spp., *Solenopsis* spp., *Smerinthus* spp., *Sophronia* spp., *Spaelotis* spp., *Spargaloma* spp., *Sparganothis* spp., *Spatalistis* spp., *Sperchia* spp., *Sphecia* spp., *Sphinx* spp., *Spilonota* spp., *Spodoptera* spp., *Spodoptera littoralis*, *Stagmatophora* spp., *Staphylinochrous* spp., *Stathmopoda* spp., *Stenodes* spp., *Sterrha* spp., *Stomoxys* spp., *Strophedra* spp., *Sunira* spp., *Sutyna* spp., *Swammerdamia* spp., *Syllomatia* spp., *Sympistis* spp., *Synanthedon* spp., *Synaxis* spp., *Syncopacma* spp., *Syndemis* spp., *Syngrapha* spp., *Synthomeida* spp., *Tabanus* spp., *Taeniarchis* spp., *Taeniothrips* spp., *Tannia* spp., *Tarsonemus* spp., *Tegulifera* spp., *Tehama* spp., *Teleiodes* spp., *Telorta* spp., *Tenebrio* spp., *Tephрина* spp., *Teratoglaea* spp., *Terri-cula* spp., *Tethea* spp., *Tetranychus* spp., *Thalpophila* spp., *Thaumetopoea* spp., *Thiodia* spp., *Thrips* spp., *Thrips palmi*, *Thrips tabaci*, *Thyridopteryx* spp., *Thyris* spp., *Tineola* spp., *Tipula* spp., *Tortricidia* spp., *Tortrix* spp., *Trachea* spp., *Trialeurodes* spp., *Trialeurodes vaporariorum*, *Triatoma* spp., *Triaxomera* spp., *Tribolium* spp., *Tricodectes* spp., *Trichoplusia* spp., *Trichoplusia ni*, *Trichoptilus* spp., *Trioza* spp., *Trioza erytrae*, *Triphaenia* spp., *Triphosa* spp., *Trogoderma* spp., *Tyria* spp., *Udea* spp., *Unaspis* spp., *Unaspis citri*, *Utetheisa* spp., *Valeriodes* spp., *Vespa* spp., *Vespamima* spp., *Vitacea* spp., *Vitula* spp., *Witlesia* spp., *Xanthia* spp., *Xanthorhoe* spp., *Xanthotype* spp., *Xenomicta* spp., *Xenopsylla* spp., *Xenopsylla cheopsis*, *Xestia* spp., *Xylena* spp., *Xylomyges* spp., *Xyrosaris* spp., *Yponomeuta* spp., *Ypsolopha* spp., *Zale* spp., *Zanclognathus* spp., *Zeiraphera* spp., *Zenodoxus* spp., *Zeuzera* spp., *Zygaena* spp.,

It is also possible to control pests of the class Nematoda using the compounds according to the invention. Such pests include, for example, root knot nematodes, cyst-forming nematodes and also stem and leaf nematodes;

especially of *Heterodera* spp., e.g. *Heterodera schachtii*, *Heterodora avenae* and *Heterodora trifolii*; *Globodera* spp., e.g. *Globodera rostochiensis*; *Meloidogyne* spp., e.g. *Meloidogyne incognita* and *Meloidogyne javanica*; *Radopholus* spp., e.g. *Radopholus similis*;

Pratylenchus, e.g. *Pratylenchus neglectans* and *Pratylenchus penetrans*; *Tylenchulus*, e.g. *Tylenchulus semipenetrans*; *Longidorus*, *Trichodorus*, *Xiphinema*, *Ditylenchus*, *Apheenchoides* and *Anguina*; especially *Meloidogyne*, e.g. *Meloidogyne incognita*, and *Heterodera*, e.g. *Heterodera glycines*.

An especially important aspect of the present invention is the use of the compounds of formula (I) according to the invention in the protection of plants against parasitic feeding pests.

The action of the compounds according to the invention and the compositions comprising them against animal pests can be significantly broadened and adapted to the given circumstances by the addition of other insecticides, acaricides or nematicides. Suitable additives include, for example, representatives of the following classes of active ingredient: organophosphorus compounds, nitrophenols and derivatives, formamidines, ureas, carbamates, pyrethroids, chlorinated hydrocarbons, neonicotinoids and *Bacillus thuringiensis* preparations.

Examples of especially suitable mixing partners include: azamethiphos; chlorfenvinphos; cypermethrin, cypermethrin high-cis; cyromazine; diafenthiuron; diazinon; dichlorvos; dicrotophos; dicyclanil; fenoxycarb; fluazuron; furathiocarb; isazofos; iodfenphos; kinoprene; lufenuron; methacriphos; methidathion; monocrotophos; phosphamidon; profenofos; diofenolan; a compound obtainable from the *Bacillus thuringiensis* strain GC91 or from strain NCTC11821; pymetrozine; bromopropylate; methoprene; disulfoton; quinalphos; taufluvalinate; thiocyclam; thiometon; aldicarb; azinphos-methyl; benfuracarb; bifenthrin; buprofezin; carbofuran; dibutylaminothio; cartap; chlorfluazuron; chlorpyrifos; cyfluthrin; lambda-cyhalothrin; alpha-cypermethrin; zeta-cypermethrin; deltamethrin; diflubenzuron; endosulfan; ethiofencarb; fenitrothion; fenobucarb; fenvalerate; formothion; methiocarb; heptenophos; imidacloprid; thiamethoxam; clothianidin; isoprocarb; methamidophos; methomyl; mevinphos; parathion; parathion-methyl; phosalone; pirimicarb; propoxur; teflubenzuron; terbufos; triazamate; fenobucarb; tebufenozide; fipronil; beta-cyfluthrin; silafluofen; fenpyroximate; pyridaben; fenazaquin; pyriproxyfen; pyrimidifen; nitenpyram; acetamiprid; emamectin; emamectin-benzoate; spinosad; a plant extract that is active against insects; a preparation that comprises nematodes and is active against insects; a preparation obtainable from *Bacillus subtilis*; a preparation that comprises fungi and is active against insects; a preparation that comprises viruses and is active against insects; chlorfenapyr; acephate; acrinathrin; alanycarb; alphamethrin; amitraz; AZ 60541; azinphos A; azinphos M;

azocyclotin; bendiocarb; bensultap; beta-cyfluthrin; BPMC; brofenprox; bromophos A; bufencarb; butocarboxin; butylpyridaben; cadusafos; carbaryl; carbophenothion; chloethocarb; chlorethoxyfos; chlormephos; cis-resmethrin; clocythrins; clofentezine; cyanophos; cycloprothrin; cyhexatin; demeton M; demeton S; demeton-S-methyl; dichlofenthion; dicliphos; diethion; dimethoate; dimethylvinphos; dioxathion; edifenphos; esfenvalerate; ethion; ethofenprox; ethoprophos; etrimphos; fenamiphos; fenbutatin oxide; fenothiocarb; fenpropathrin; fenpyrad; fenthion; fluazinam; flucycloxuron; flucythrinate; flufenoxuron; flufenprox; fonophos; fosthiazate; fubfenprox; HCH; hexaflumuron; hexythiazox; IKI-220; iprobenfos; isofenphos; isoxathion; ivermectin; malathion; mecarbam; mesulfenphos; metaldehyde; metolcarb; milbemectin; moxidectin; naled; NC 184; omethoate; oxamyl; oxydemethon M; oxydeprofos; permethrin; phenthoate; phorate; phosmet; phoxim; pirimiphos M; pirimiphos E; promecarb; propaphos; prothiofos; prothoate; pyrachlophos; pyradaphenthion; pyresmethrin; pyrethrum; tebufenozide; salithion; sebufos; sulfotep; sulprofos; tebufenpyrad; tebupirimphos; tefluthrin; temephos; terbam; tetrachlorvinphos; thiachlorprid; thiafenox; thiodicarb; thiofanox; thionazin; thuringiensin; tralomethrin; triarathene; triazophos; triazuron; trichlorfon; triflumuron; trimethacarb; vamidothion; xylylcarb; YI 5301/5302; zetamethrin; DPX-MP062 — indoxacarb; methoxyfenozide; bifenazate; XMC (3,5-xylyl methylcarbamate); or the fungus pathogen *Metarhizium anisopliae*.

The compounds according to the invention can be used to control, i.e. to inhibit or destroy, pests of the mentioned type occurring on plants, especially on useful plants and ornamentals in agriculture, in horticulture and in forestry, or on parts of such plants, such as the fruits, blossoms, leaves, stems, tubers or roots, while in some cases plant parts that grow later are still protected against those pests.

Target crops include especially cereals, such as wheat, barley, rye, oats, rice, maize and sorghum; beet, such as sugar beet and fodder beet; fruit, e.g. pomes, stone fruit and soft fruit, such as apples, pears, plums, peaches, almonds, cherries and berries, e.g. strawberries, raspberries and blackberries; leguminous plants, such as beans, lentils, peas and soybeans; oil plants, such as rape, mustard, poppy, olives, sunflowers, coconut, castor oil, cocoa and groundnuts; cucurbitaceae, such as marrows, cucumbers and melons; fibre plants, such as cotton, flax, hemp and jute; citrus fruits, such as oranges, lemons, grapefruit and mandarins; vegetables, such as spinach, lettuce, asparagus, cabbages, carrots, onions, tomatoes, potatoes and paprika; lauraceae, such as avocado, cinnamon and camphor; and tobacco, nuts, coffee, aubergines, sugar cane, tea, pepper, vines, hops, bananas, natural rubber plants and ornamentals.

Further areas of use of the compounds according to the invention are the protection of stored goods and storerooms and the protection of raw materials, and also in the hygiene sector, especially the protection of domestic animals and productive livestock against pests of the mentioned type, more especially the protection of domestic animals, especially cats and dogs, from infestation by fleas, ticks and nematodes.

The invention therefore relates also to pesticidal compositions, such as emulsifiable concentrates, suspension concentrates, directly sprayable or dilutable solutions, spreadable pastes, dilute emulsions, wettable powders, soluble powders, dispersible powders, wettable powders, dusts, granules and encapsulations of polymer substances, that comprise at least one of the compounds according to the invention, the choice of formulation being made in accordance with the intended objectives and the prevailing circumstances.

The active ingredient is used in those compositions in pure form, a solid active ingredient, for example, in a specific particle size, or preferably together with at least one of the adjuvants customary in formulation technology, such as extenders, e.g. solvents or solid carriers, or surface-active compounds (surfactants). In the area of parasite control in humans, domestic animals, productive livestock and pets it will be self-evident that only physiologically tolerable additives are used.

Solvents are, for example: non-hydrogenated or partly hydrogenated aromatic hydrocarbons, preferably fractions C₈ to C₁₂ of alkylbenzenes, such as xylene mixtures, alkylated naphthalenes or tetrahydronaphthalene, aliphatic or cycloaliphatic hydrocarbons, such as paraffins or cyclohexane, alcohols, such as ethanol, propanol or butanol, glycols and ethers and esters thereof, such as propylene glycol, dipropylene glycol ether, ethylene glycol or ethylene glycol monomethyl or -ethyl ether, ketones, such as cyclohexanone, isophorone or diacetone alcohol, strongly polar solvents, such as N-methylpyrrolid-2-one, dimethyl sulfoxide or N,N-dimethylformamide, water, non-epoxidized or epoxidized plant oils, such as non-epoxidized or epoxidized rapeseed, castor, coconut or soya oil, and silicone oils.

Suitable carriers and adjuvants include all substances customarily used in crop protection products, especially products for the control of slugs and snails.

The solid carriers used, for example for dusts and dispersible powders, are as a rule natural rock powders, such as calcite, talc, kaolin, montmorillonite or attapulgite. Highly disperse silicic acids or highly disperse absorbent polymers can also be added to improve

the physical properties. Granular adsorptive granule carriers are porous types, such as pumice, crushed brick, sepiolite or bentonite, and non-sorbent carrier materials are calcite or sand. A large number of granular materials of inorganic or organic nature can furthermore be used, in particular dolomite or comminuted plant residues.

Surface-active compounds are, depending on the nature of the active compound to be formulated, nonionic, cationic and/or anionic surfactants or surfactant mixtures with good emulsifying, dispersing and wetting properties. The surfactants listed below are to be regarded only as examples; many other surfactants which are customary in formulation technology and are suitable according to the invention are described in the relevant literature.

Nonionic surfactants are, in particular, polyglycol ether derivatives of aliphatic or cycloaliphatic alcohols, saturated or unsaturated fatty acids and alkylphenols, which can contain 3 to 30 glycol ether groups and 8 to 20 carbon atoms in the (aliphatic) hydrocarbon radical and 6 to 18 carbon atoms in the alkyl radical of the alkylphenols. Substances which are furthermore suitable are water-soluble polyethylene oxide adducts, containing 20 to 250 ethylene glycol ether and 10 to 100 propylene glycol ether groups, on propylene glycol, ethylene diaminopolypropylene glycol and alkyl polypropylene glycol having 1 to 10 carbon atoms in the alkyl chain. The compounds mentioned usually contain 1 to 5 ethylene glycol units per propylene glycol unit. Examples are nonylphenol-polyethoxyethanols, castor oil polyglycol ethers, polypropylene-polyethylene oxide adducts, tributylphenoxypolyethoxyethanol, polyethylene glycol and octylphenoxypolyethoxyethanol. Other substances are fatty acid esters of polyoxyethylene sorbitan, such as polyoxyethylene sorbitan trioleate.

The cationic surfactants are, in particular, quaternary ammonium salts which contain, as substituents, at least one alkyl radical having 8 to 22 C atoms and, as further substituents, lower, non-halogenated or halogenated alkyl, benzyl or lower hydroxyalkyl radicals. The salts are preferably in the form of halides, methyl-sulfates or ethyl-sulfates. Examples are stearyl-trimethyl-ammonium chloride and benzyl-di-(2-chloroethyl)-ethyl-ammonium bromide.

Suitable anionic surfactants can be both water-soluble soaps and water-soluble synthetic surface-active compounds. Suitable soaps are the alkali metal, alkaline earth metal and substituted or unsubstituted ammonium salts of higher fatty acids (C_{10} - C_{22}), such as the sodium or potassium salts of oleic or stearic acid, or of naturally occurring fatty acid mixtures, which can be obtained, for example, from coconut oil or tall oil; and furthermore

also the fatty acid methyl-aurine salts. However, synthetic surfactants are more frequently used, in particular fatty sulfonates, fatty sulfates, sulfonated benzimidazole derivatives or alkylarylsulfonates. The fatty sulfonates and sulfates are as a rule in the form of alkali metal, alkaline earth metal or substituted or unsubstituted ammonium salts and in general have an alkyl radical of 8 to 22 C atoms, alkyl also including the alkyl moiety of acyl radicals; examples are the sodium or calcium salt of ligninsulfonic acid, of dodecylsulfuric acid ester or of a fatty alcohol sulfate mixture prepared from naturally occurring fatty acids. These also include the salts of sulfuric acid esters and sulfonic acids of fatty alcohol-ethylene oxide adducts. The sulfonated benzimidazole derivatives preferably contain 2 sulfonic acid groups and a fatty acid radical having about 8 to 22 C atoms. Alkylarylsulfonates are, for example, the sodium, calcium or triethanolammonium salts of dodecylbenzenesulfonic acid, of dibutyl-naphthalenesulfonic acid or of a naphthalenesulfonic acid-formaldehyde condensation product. Corresponding phosphates, such as salts of the phosphoric acid ester of a p-nonylphenol-(4-14)-ethylene oxide adduct or phospholipids, can further also be used.

The compositions as a rule comprise 0.1 to 99 %, in particular 0.1 to 95 %, of active compound and 1 to 99.9 %, in particular 5 to 99.9 %, of - at least - one solid or liquid auxiliary, it being possible as a rule for 0 to 25 %, in particular 0.1 to 20 %, of the composition to be surfactants (% is in each case per cent by weight). While concentrated compositions are more preferred as commercial goods, the end user as a rule uses dilute compositions which comprise considerably lower concentrations of active compound. Preferred compositions are composed, in particular, as follows (% = per cent by weight):

Emulsifiable concentrates:

active ingredient:	1 to 90%, preferably 5 to 20%
surfactant:	1 to 30%, preferably 10 to 20%
solvent:	5 to 98%, preferably 70 to 85%

Dusts:

active ingredient:	0.1 to 10%, preferably 0.1 to 1%
solid carrier:	99.9 to 90%, preferably 99.9 to 99%

Suspension concentrates:

active ingredient:	5 to 75%, preferably 10 to 50%
water:	94 to 24%, preferably 88 to 30%
surfactant:	1 to 40%, preferably 2 to 30%

Wettable powders:

active ingredient:	0.5 to 90%, preferably 1 to 80%
surfactant:	0.5 to 20%, preferably 1 to 15%
solid carrier:	5 to 99%, preferably 15 to 98%

Granules:

active ingredient:	0.5 to 30%, preferably 3 to 15%
solid carrier:	99.5 to 70%, preferably 97 to 85%

The compositions according to the invention may also comprise further solid or liquid adjuvants, such as stabilisers, e.g. vegetable oils or epoxidised vegetable oils (e.g. epoxidised coconut oil, rapeseed oil or soybean oil), antifoams, e.g. silicone oil, preservatives, viscosity regulators, binders and/or tackifiers as well as fertilisers or other active ingredients for obtaining special effects, e.g. acaricides, bactericides, fungicides, nematocides, molluscicides or selective herbicides.

The crop protection products according to the invention are prepared in known manner, in the absence of adjuvants, e.g. by grinding, sieving and/or compressing a solid active ingredient or mixture of active ingredients, for example to a certain particle size, and in the presence of at least one adjuvant, for example by intimately mixing and/or grinding the active ingredient or mixture of active ingredients with the adjuvant(s). The invention relates likewise to those processes for the preparation of the compositions according to the invention and to the use of the compounds of formula (I) in the preparation of those compositions.

The invention relates also to the methods of application of the crop protection products, i.e. the methods of controlling pests of the mentioned type, such as spraying, atomising, dusting, coating, dressing, scattering or pouring, which are selected in accordance with the intended objectives and the prevailing circumstances, and to the use of the compositions for controlling pests of the mentioned type. Typical rates of concentration are from 0.1 to 1000 ppm, preferably from 0.1 to 500 ppm, of active ingredient. The rates of application per hectare are generally from 1 to 2000 g of active ingredient per hectare, especially from 10 to 1000 g/ha, preferably from 20 to 600 g/ha.

A preferred method of application in the area of crop protection is application to the foliage of the plants (foliar application), the frequency and the rate of application being dependent upon the risk of infestation by the pest in question. However, the active ingredient

can also penetrate the plants through the roots (systemic action) when the locus of the plants is impregnated with a liquid formulation or when the active ingredient is incorporated in solid form into the locus of the plants, for example into the soil, e.g. in granular form (soil application). In the case of paddy rice crops, such granules may be applied in metered amounts to the flooded rice field.

The crop protection products according to the invention are also suitable for protecting plant propagation material, e.g. seed, such as fruits, tubers or grains, or plant cuttings, against animal pests. The propagation material can be treated with the composition before planting: seed, for example, can be dressed before being sown. The active ingredients according to the invention can also be applied to grains (coating), either by impregnating the seeds in a liquid formulation or by coating them with a solid formulation. The composition can also be applied to the planting site when the propagation material is being planted, for example to the seed furrow during sowing.

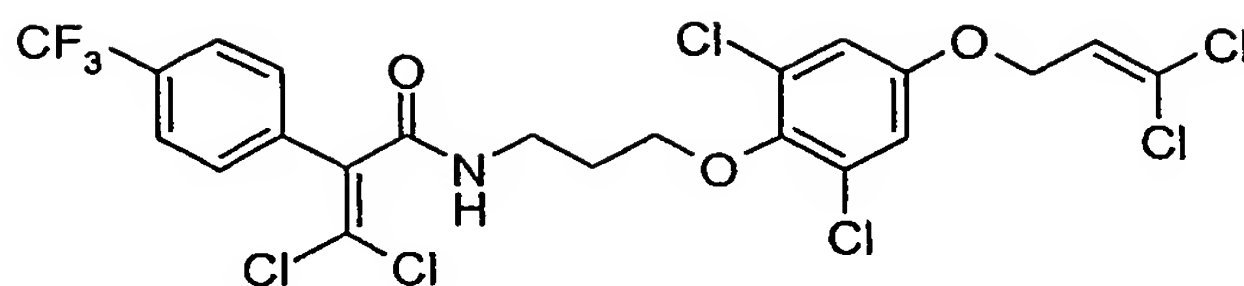
The compositions according to the invention are also suitable for protecting plant propagation material, including genetically modified propagation material, e.g. seed, such as fruits, tubers or grains, or plant seedlings, against animal pests. The propagation material can be treated with the composition before being planted: seed, for example, can be dressed before being sown. The active ingredients according to the invention can also be applied to grains (coating), either by impregnating the seeds in a liquid formulation or by coating them with a solid formulation. The composition can also be applied to the planting site when the propagation material is being planted, for example to the seed furrow during sowing. The invention relates also to such methods of treating plant propagation material and to the plant propagation material so treated.

The following Examples serve to illustrate the invention. They do not limit the invention. Temperatures are given in degrees Celsius; mixing ratios of solvents are given in parts by volume.

Preparation Examples:

Example P1): Preparation of 3,3-dichloro-N-{3-[2,6-dichloro-4-(3,3-dichloro-allyloxy)-phenoxy]-propyl}-2-(4-trifluoromethyl-phenyl)-acrylamide

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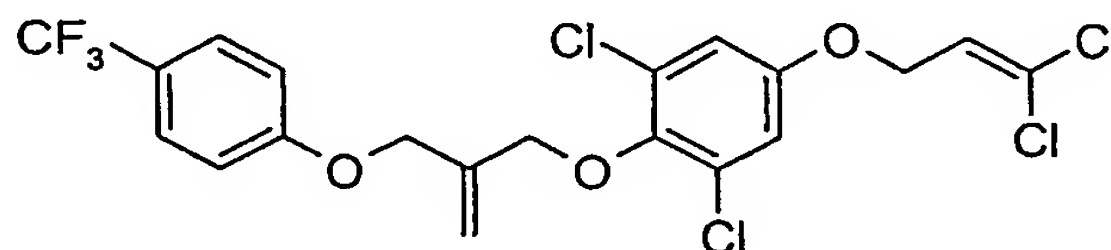


P1.1): 680 mg of oxo-(4-trifluoromethyl-phenyl)-acetic acid ethyl ester and 2.2 g of triphenylphosphine are introduced into 8 ml of acetonitrile. 0.8 ml of carbon tetrachloride is then added and the mixture is heated at reflux for 4 hours. The reaction mixture is concentrated completely and the crude product is purified over silica gel. 3,3-Dichloro-2-(4-trifluoromethyl-phenyl)-acrylic acid ethyl ester is obtained. $^1\text{H-NMR}$ (CDCl_3) 300 MHz: 1.30 (t,3H), 4.30 (q,2H), 7.52 (d,2H), 7.68 (d,2H).

P1.2): 650 mg of 3,3-dichloro-2-(4-trifluoromethyl-phenyl)-acrylic acid ethyl ester are introduced into 4 ml of tetrahydrofuran. 100 mg of lithium hydroxide in 1.5 ml of water are then added and the mixture is stirred at room temperature for 16 hours. After a further 4 hours at 40°C , the reaction mixture is poured into water, rendered acidic with concentrated hydrochloric acid and extracted with ethyl acetate. The organic phases are washed twice with water and concentrated. 3,3-Dichloro-2-(4-trifluoromethyl-phenyl)-acrylic acid is obtained.

P1.3): 74 mg of 3,3-dichloro-2-(4-trifluoromethyl-phenyl)-acrylic acid, 67 mg of bis(2-oxo-3-oxazolidinyl)-phosphinic acid chloride, 53 mg of triethylamine and 100 mg of 3-[2,6-dichloro-4-(3,3-dichloro-allyloxy)-phenoxy]-propylamine are stirred in 2 ml of dichloromethane for 48 hours at 40°C . The reaction mixture is diluted with 16 ml of ethyl acetate and washed twice with aqueous potassium carbonate solution. After concentration of the organic phase and purification over silica gel, the title compound is obtained.

Example P2): Preparation of 1,3-dichloro-5-(3,3-dichloro-allyloxy)-2-[2-(4-trifluoromethyl-phenoxy)-2-oxoethyl]-benzene



P2.1): 5 g of 4-hydroxybenzotrifluoride, 12.8 g of potassium carbonate, 500 mg of potassium iodide and 18 g of epichlorohydrin are stirred in 75 ml of acetone for 15 hours at 60°C . The reaction mixture is filtered and the filtrate is concentrated. The residue is taken up in ethyl acetate and washed with water. After concentration of the organic phase and

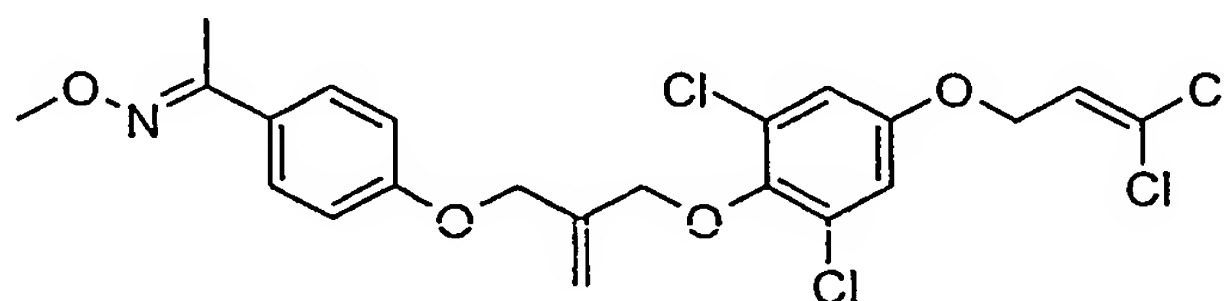
Kugelrohr distillation, 2-(4-trifluoromethyl-phenoxy-methyl)-oxirane is obtained. (b.p.₂₀ 145-150°C)

P2.2): 8 g of 2-(4-trifluoromethyl-phenoxy-methyl)-oxirane and 3.8 g of 2,6-dichloro-4-(3,3-dichloro-allyloxy)-phenol are stirred in 80 ml of N-ethyl-diisopropylamine and 50 ml of toluene for 14 days at 100°C. The reaction mixture is concentrated, and the residue is taken up in ethyl acetate and washed with hydrochloric acid and water. After concentration of the organic phase and purification over silica gel, 1-[2,6-dichloro-4-(3,3-dichloro-allyloxy)-phenoxy]-3-(4-trifluoromethyl-phenoxy)-propan-2-ol is obtained. ¹H-NMR (CDCl₃) 300 MHz: 2.81 (d,1H), 4.15-4.48 (m,5H), 4.59 (d,2H), 6.11 (t,1H), 6.86 (s,2H), 7.01 (d,2H), 7.58 (d,2H)

P2.3): 1.15 ml of dimethyl sulfoxide are added at -60°C in the course of 5 minutes to 0.63 ml of oxalyl chloride in 50 ml of dichloromethane. After 40 minutes, a solution of 3.4 g of 1-[2,6-dichloro-4-(3,3-dichloro-allyloxy)-phenoxy]-3-(4-trifluoromethyl-phenoxy)-propan-2-ol in 30 ml of dichloromethane is added dropwise in the course of 10 minutes. After 40 minutes, 4.5 ml of triethylamine are added and the reaction mixture is slowly heated to room temperature. The reaction mixture is then poured into water and extracted with dichloromethane. After concentration of the organic phase and crystallisation from diethyl ether/hexane, 1-[2,6-dichloro-4-(3,3-dichloro-allyloxy)-phenoxy]-3-(4-trifluoromethyl-phenoxy)-propan-2-one is obtained. ¹H-NMR (CDCl₃) 300 MHz: 4.61 (d,2H), 4.74 (s,2H), 5.21 (s,2H), 6.12 (t,1H), 6.90 (s,2H), 7.11 (d,2H), 7.59 (d,2H)

P2.4): 189 mg of potassium tert-butyrate and 532 mg of methyltriphenylphosphonium bromide are heated in 8 ml of toluene for 3 hours at 80°C. The reaction mixture is cooled to 50°C and a solution of 500 mg of 1-[2,6-dichloro-4-(3,3-dichloro-allyloxy)-phenoxy]-3-(4-trifluoromethyl-phenoxy)-propan-2-one in 5 ml of toluene is added in the course of 5 minutes. After 2 hours at 80°C, the reaction mixture is filtered, diluted with ethyl acetate and washed with water. After concentration of the organic phase and purification over silica gel, the title compound is obtained.

Example P3): Preparation of 1-(4-{2-[2,6-dichloro-4-(3,3-dichloro-allyloxy)-phenoxy-methyl]-allyloxy}-phenyl)-ethanone O-methyl-oxime

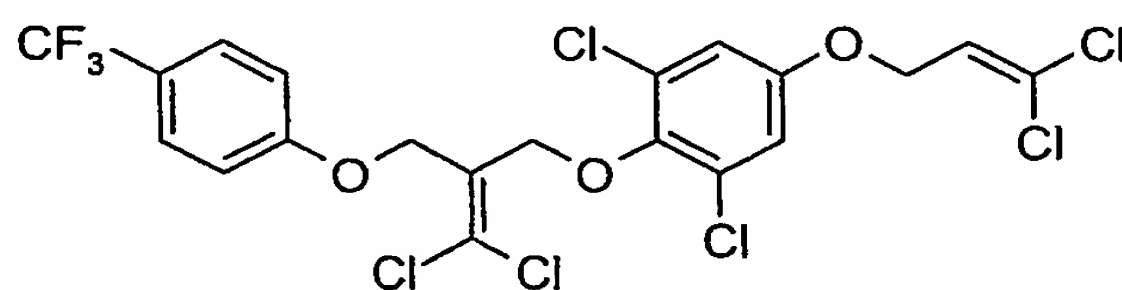


P3.1) 20 g of 2,6-dichloro-4-(3,3-dichloro-allyloxy)-phenol and 28.8 g of potassium carbonate are introduced into 150 ml of acetonitrile. 26 g of 3-chloro-2-chloromethyl-propene are then added and the mixture is stirred for 2.5 hours at 80°C. The reaction mixture is cooled to room temperature and filtered, and the filtrate is concentrated. After purification over silica gel, 1,3-dichloro-2-(2-chloromethyl-allyloxy)-5-(3,3-dichloro-allyloxy)-benzene is obtained.

P3.2) 1.6 g of 1,3-dichloro-2-(2-chloromethyl-allyloxy)-5-(3,3-dichloro-allyloxy)-benzene and 686 mg of 4-hydroxyacetophenone are introduced into 25 ml of acetonitrile. 1.7 g of potassium carbonate and 50 mg of potassium iodide are then added and the mixture is stirred for 3 hours at 80°C. The reaction mixture is filtered and the filtrate is concentrated. After purification over silica gel, 1-(4-{2-[2,6-dichloro-4-(3,3-dichloro-allyloxy)-phenoxy]methyl}-allyloxy)-phenyl)-ethanone is obtained.

P3.3) 286 mg of 1-(4-{2-[2,6-dichloro-4-(3,3-dichloro-allyloxy)-phenoxy]methyl}-allyloxy)-phenyl)-ethanone and 56 mg of O-methyl-hydroxylamine hydrochloride are introduced into 4 ml of methanol. 55 mg of sodium acetate are then added and the mixture is stirred for 24 hours at 25°C. The reaction mixture is diluted with 12 ml of ethyl acetate and washed twice with water. After concentration of the organic phase and purification over silica gel, the title compound is obtained.

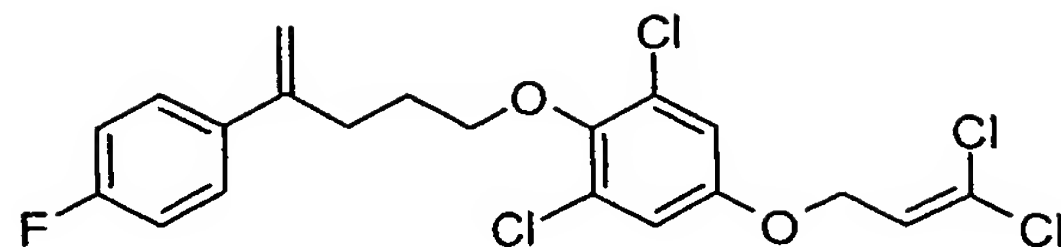
Example P4): Preparation of 1,3-dichloro-5-(3,3-dichloro-allyloxy)-2-[3,3-dichloro-2-(4-trifluoromethyl-phenoxy)methyl]-allyloxy]-benzene



312 mg of triphenylphosphine, 183 mg of carbon tetrachloride and 200 mg of 1-[2,6-dichloro-4-(3,3-dichloro-allyloxy)-phenoxy]-3-(4-trifluoromethyl-phenoxy)-propan-2-one are stirred in 3 ml of acetonitrile for 24 hours at 55°C. The reaction mixture is concentrated and the residue is purified over silica gel. The title compound is obtained.

Example P5): Preparation of 1,3-dichloro-5-(3,3-dichloro-allyloxy)-2-[4-(4-fluoro-phenyl)-pent-4-enyloxy]-benzene

- 40 -

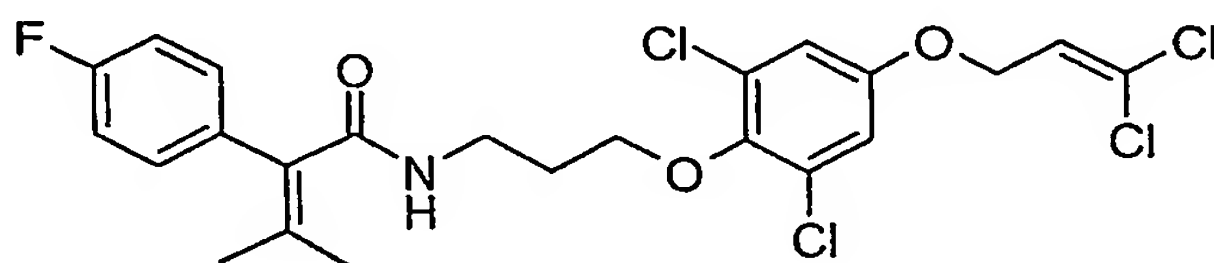


P5.1) 2.0 g of 2-(3-chloro-propyl)-2-(4-fluoro-phenyl)-[1,3]dioxolane are added to a suspension of 2.36 g of 2,6-dichloro-4-(3,3-dichloro-allyloxy)-phenol, 1.7 g of potassium carbonate and 120 mg of potassium iodide in 50 ml of acetone. The mixture is then stirred for 48 hours at 60°C. The reaction mixture is concentrated and the residue is taken up in water and extracted with ethyl acetate. After concentration of the organic phase and purification over silica gel, 2-{3-[2,6-dichloro-4-(3,3-dichloro-allyloxy)-phenoxy]-propyl}-2-(4-fluoro-phenyl)-[1,3]dioxolane is obtained.

P5.2) 2.0 g of 2-{3-[2,6-dichloro-4-(3,3-dichloro-allyloxy)-phenoxy]-propyl}-2-(4-fluoro-phenyl)-[1,3]dioxolane are dissolved in 20 ml of ethanol, and 1.95 g of 10% aqueous hydrochloric acid are added thereto. After stirring for 16 hours at 80°C, the reaction mixture is concentrated. After purification over silica gel, 4-[2,6-dichloro-4-(3,3-dichloro-allyloxy)-phenoxy]-1-(4-fluoro-phenyl)-butan-1-one is obtained.

P5.3) 84 mg of potassium tert-butyrate and 236 mg of methyltriphenylphosphonium bromide are stirred in 6 ml of toluene for 3 hours at 80°C. 200 mg of 4-[2,6-dichloro-4-(3,3-dichloro-allyloxy)-phenoxy]-1-(4-fluoro-phenyl)-butan-1-one in 2 ml of toluene are then added and the mixture is stirred for a further 2 hours at 80°C. The reaction mixture is cooled and filtered and the filtrate is concentrated. After purification over silica gel, the title compound is obtained.

Example P6): Preparation of 2-(4-fluoro-phenyl)-3-methyl-but-2-enoic acid {3-[2,6-dichloro-4-(3,3-dichloro-allyloxy)-phenoxy]-propyl}-amide

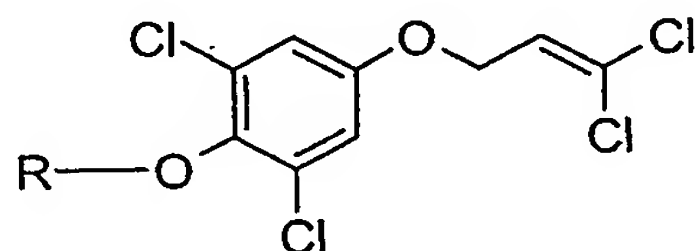


233 mg of 2-(4-fluoro-phenyl)-3-methyl-but-2-enoic acid are introduced into 10 ml of toluene. 10 mg of dimethylformamide and 0.17 ml of thionyl chloride are then added and the mixture is stirred for 2 hours at 110°C. The reaction mixture is concentrated and the residue is added to a solution of 343 mg of 2-[2,6-dichloro-4-(3,3-dichloroallyloxy)-phenoxy]-propylamine hydrochloride, 0.23 ml of pyridine and 0.13 ml of triethylamine in 20 ml of dichloromethane. After stirring for 2 hours at room temperature, the reaction mixture is

poured into water and extracted with dichloromethane. After concentration of the organic phase and purification over silica gel, the title compound is obtained.

Example P7: The further Examples in the following Tables can also be prepared in a manner analogous to that described above.

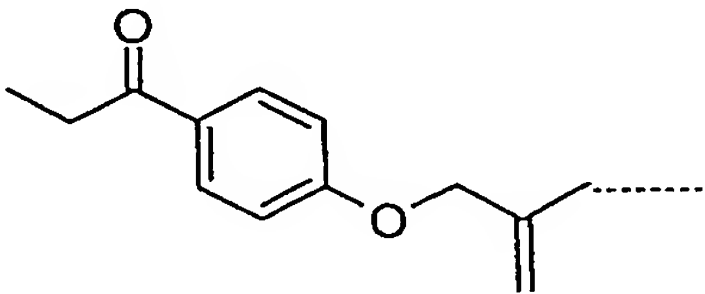
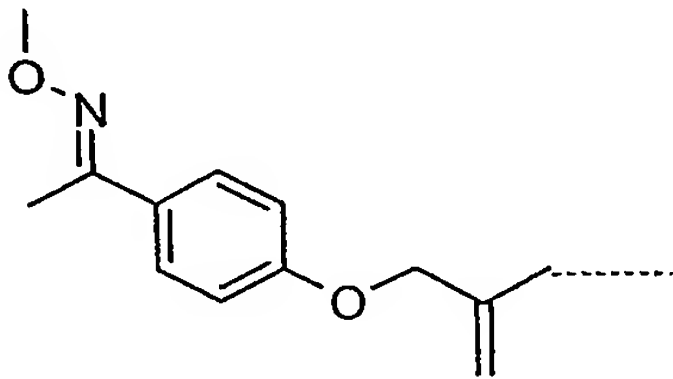
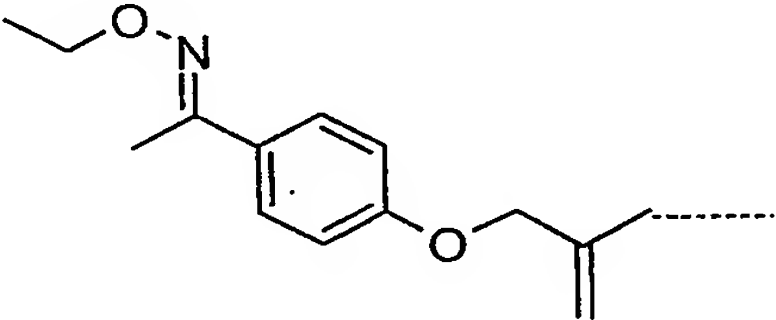
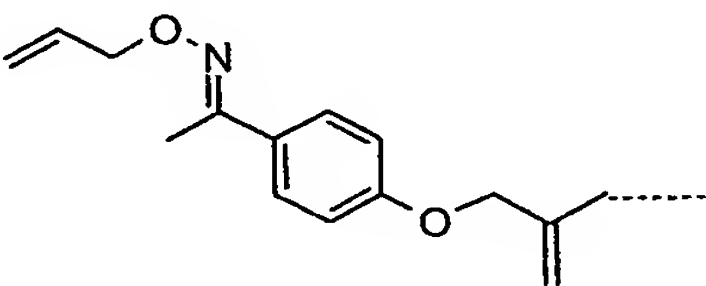
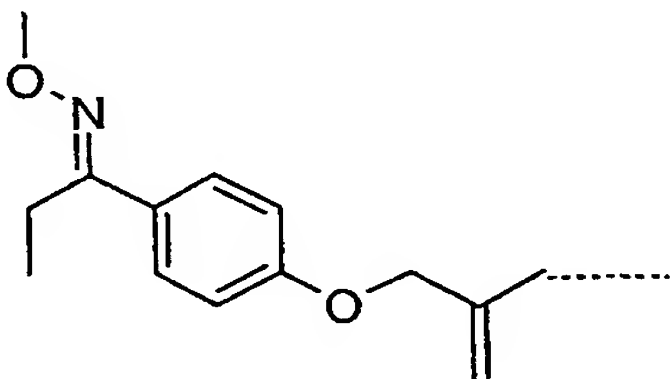
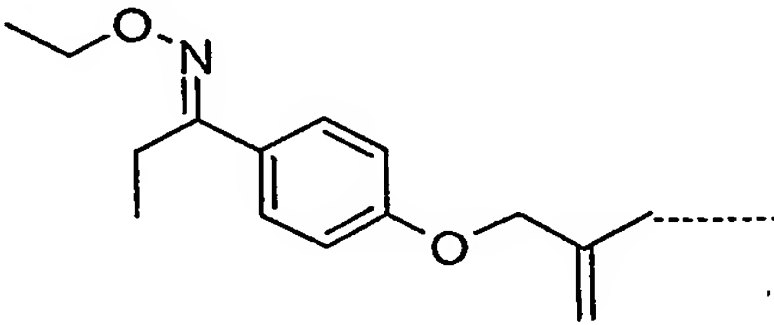
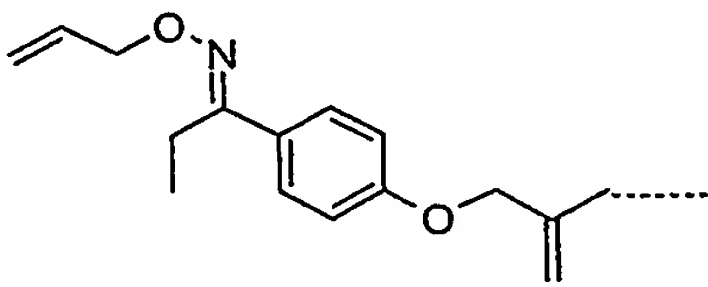
Table 1: Compounds of formula

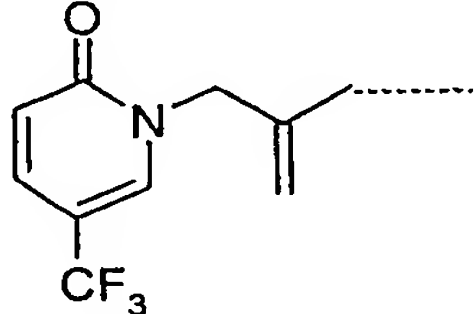
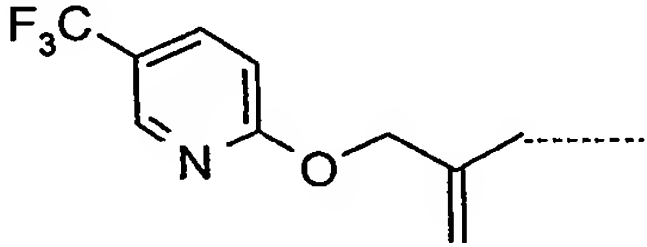
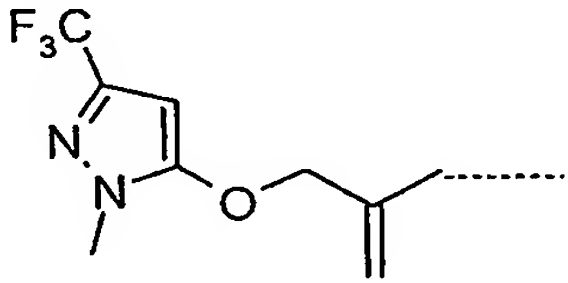
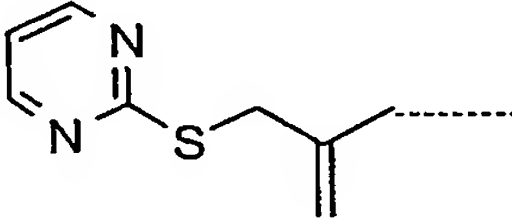
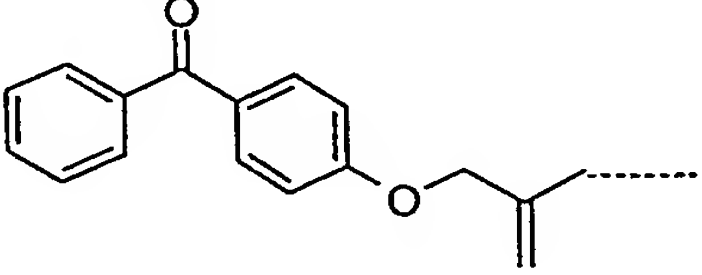
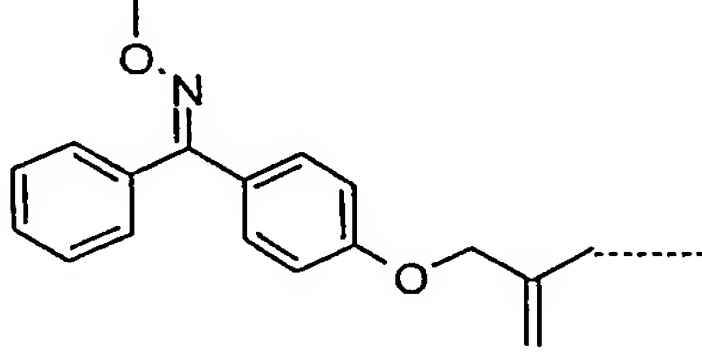
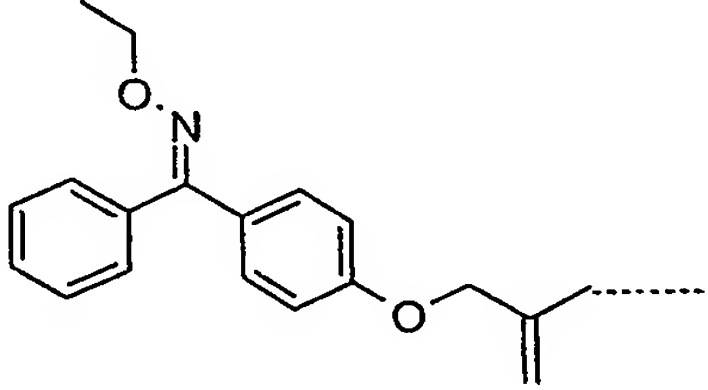
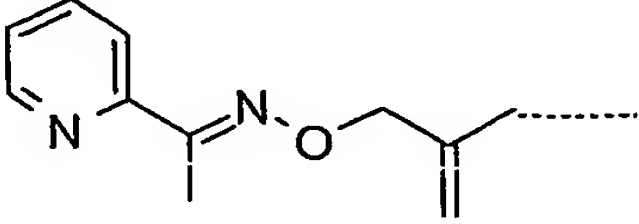


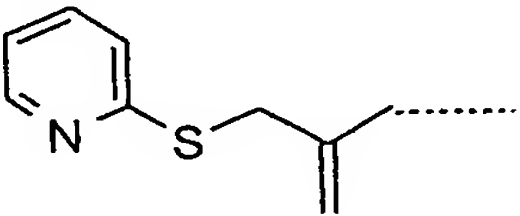
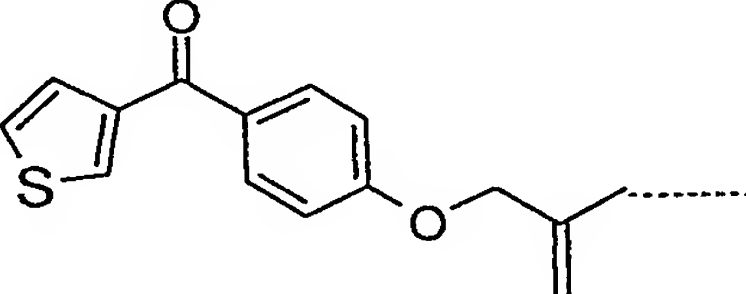
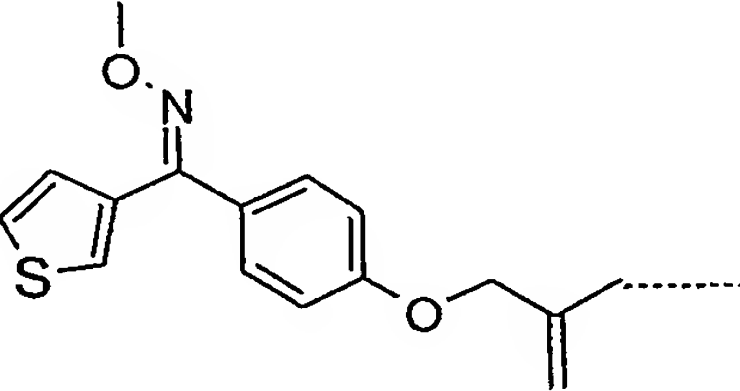
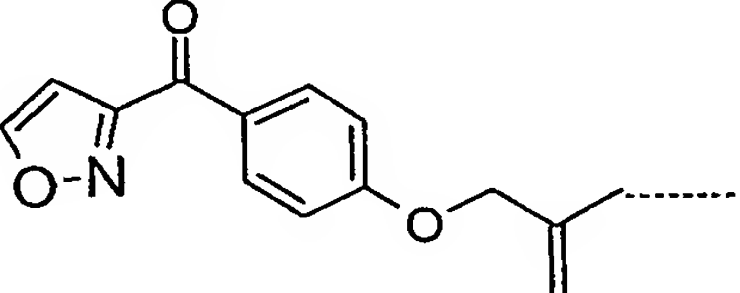
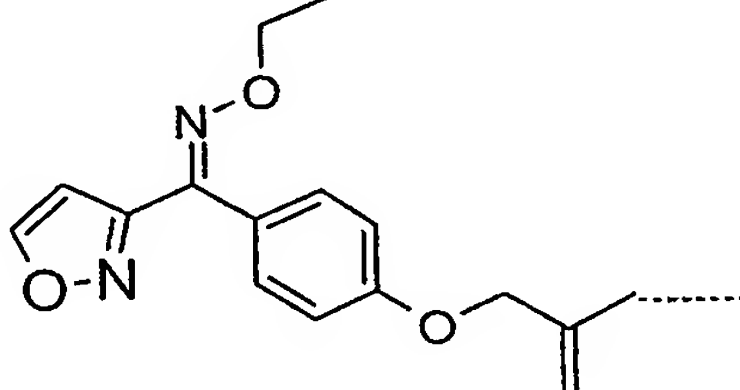
wherein the symbol ----- indicates the bond to the basic structure

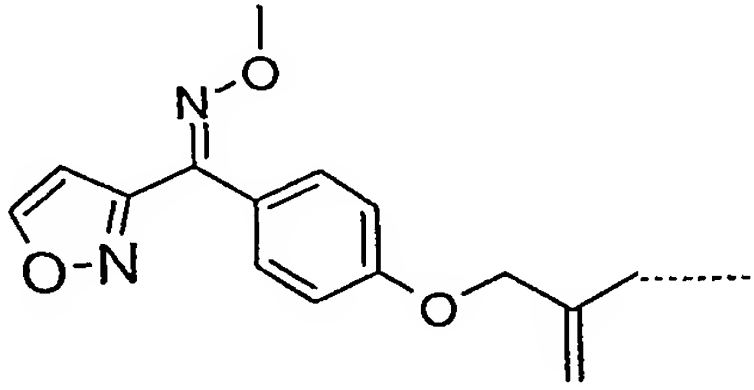
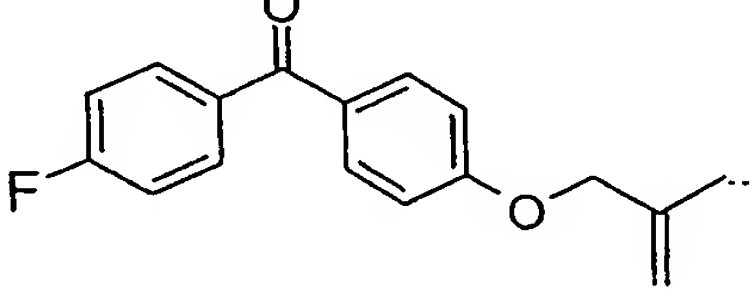
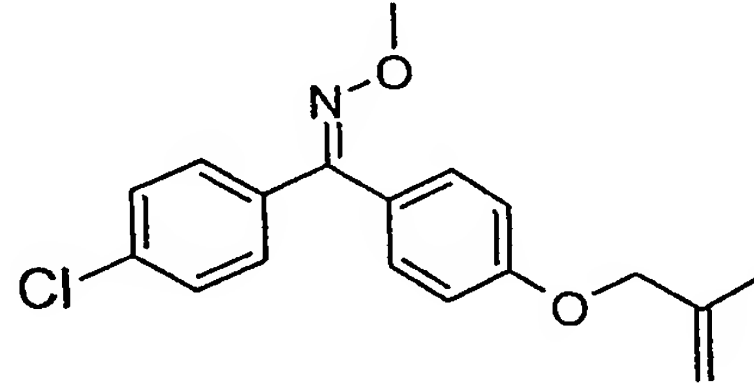
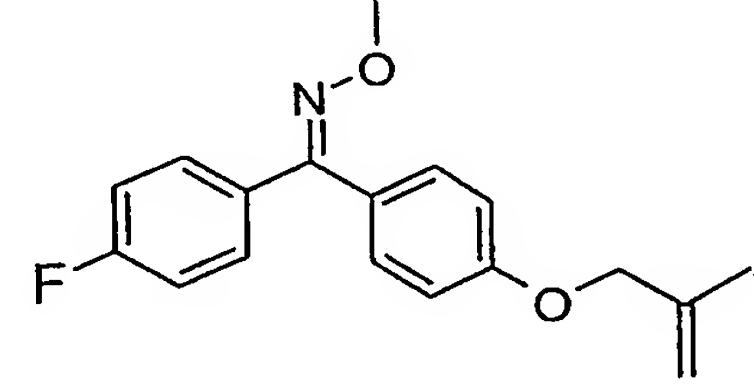
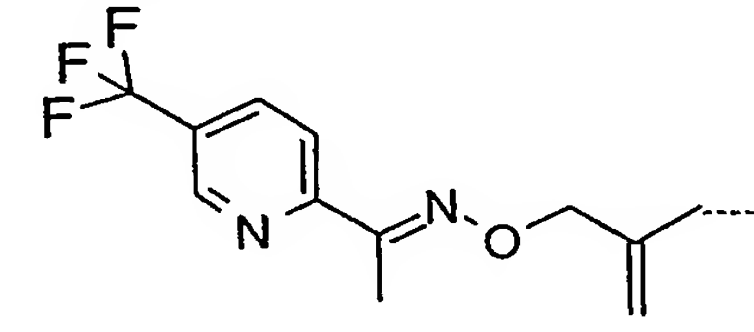
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1.2		2.03 (m,2H), 3.65 (m,2H), 4.00 (t,2H), 4.60 (d,2H), 6.11 (t,1H), 6.46 (s,NH), 6.82 (s,2H), 7.51-7.63 (m,4H)
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1.4		m.p.: 73-76°C
1.5		Resin
1.6		m.p.: 60-66°C

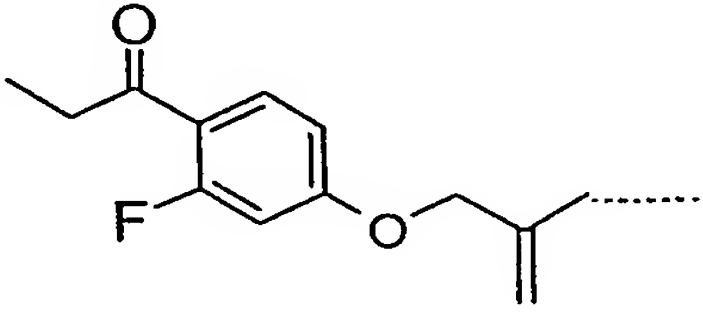
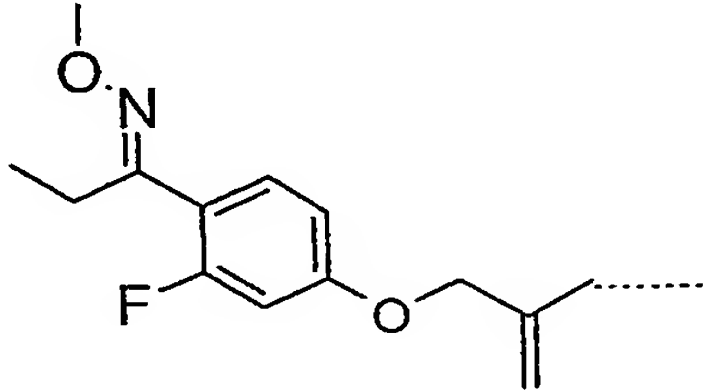
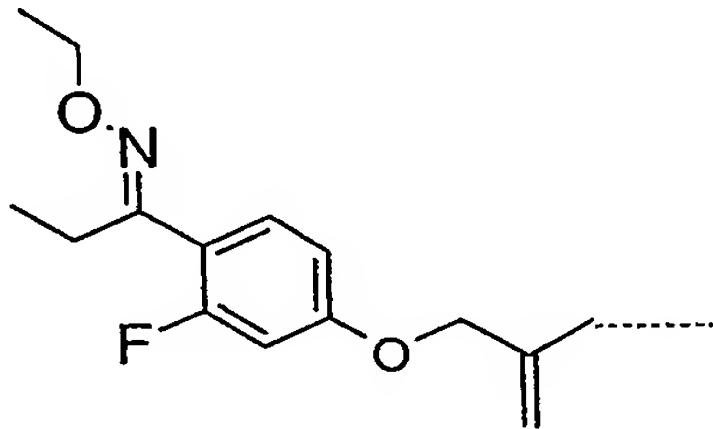
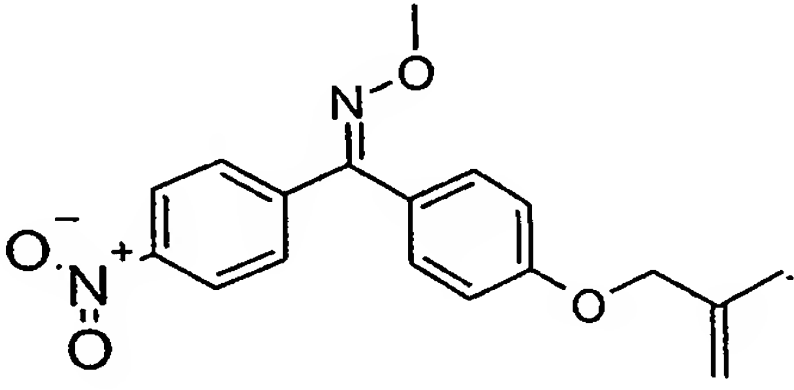
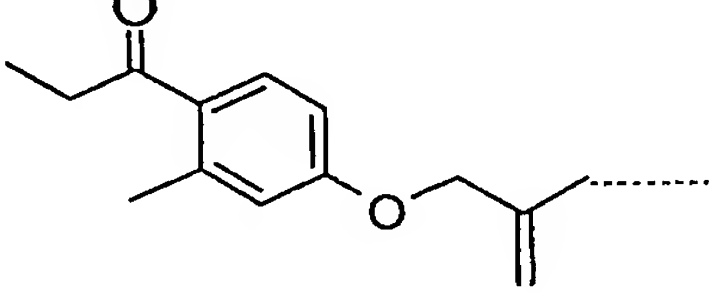
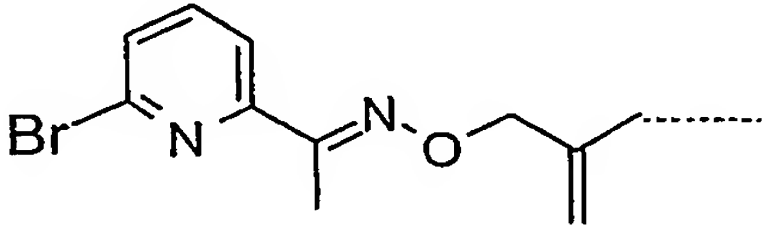
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1.10		4.58 (d,2H), 4.81 (s,2H), 5.02 (s,2H), 6.10 (t,1H), 6.83 (s,2H), 7.02 (d,2H), 7.58 (d,2H)
1.11		m.p.: 83-87°C
1.12		N _D ²⁰ : 1.5852
1.13		Resin
1.14		Resin
1.15		m.p.: 86-88°C
1.16		

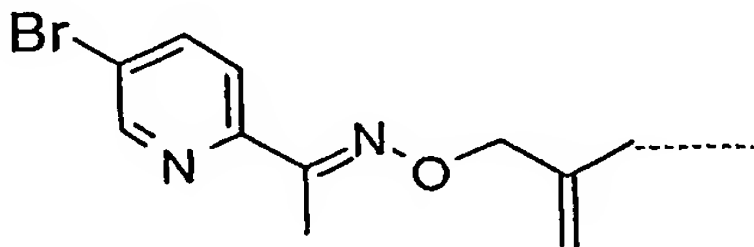
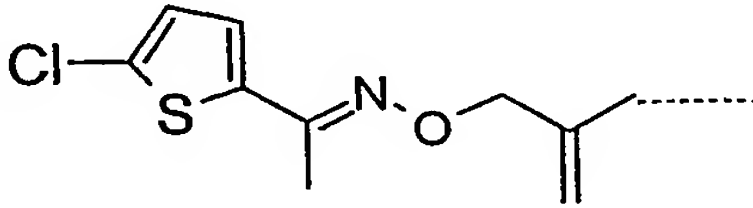
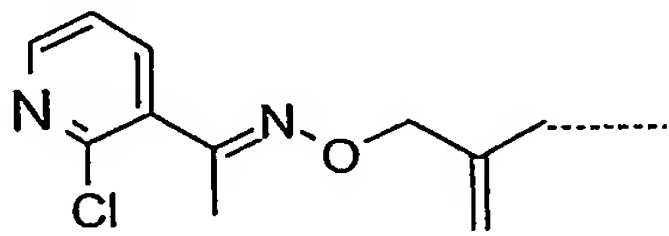
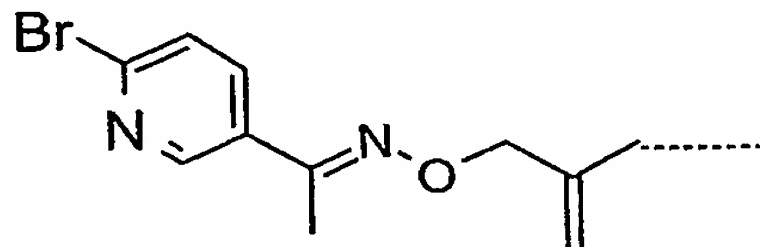
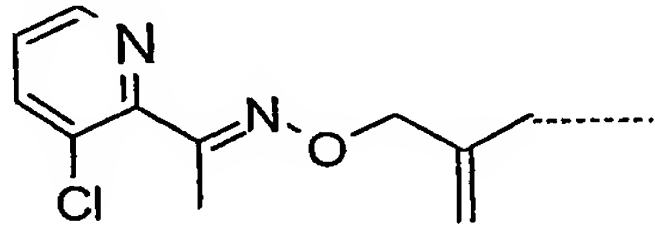
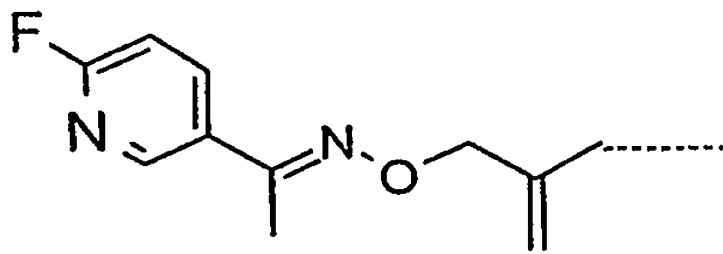
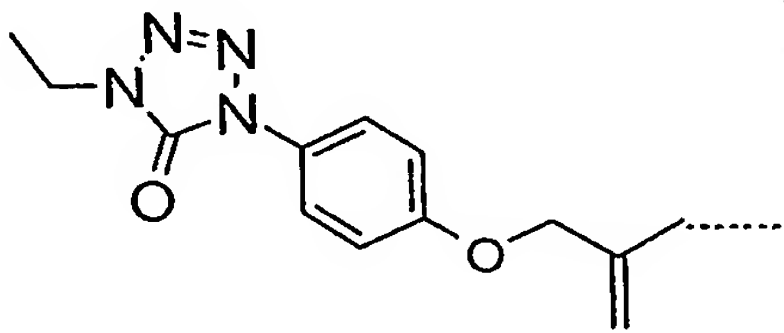
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1.19		n_D^{20} : 1.5815
1.20		n_D^{20} : 1.5849
1.21		n_D^{20} : 1.5801
1.22		n_D^{20} : 1.5757
1.23		n_D^{20} : 1.5792

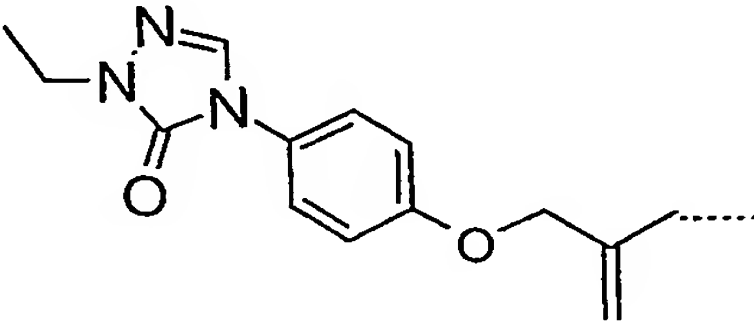
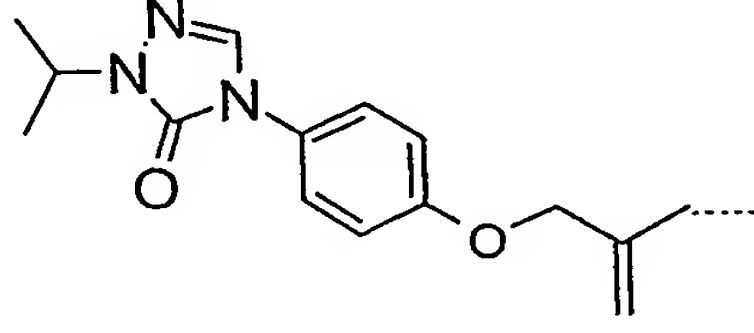
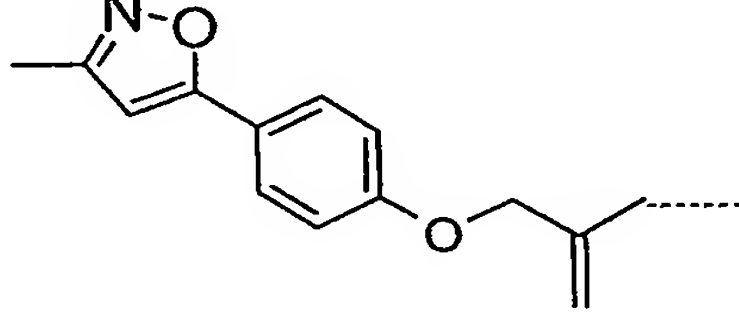
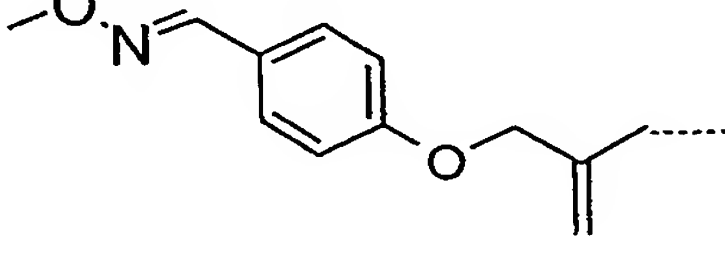
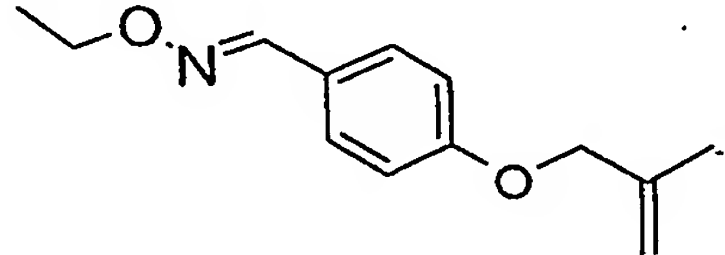
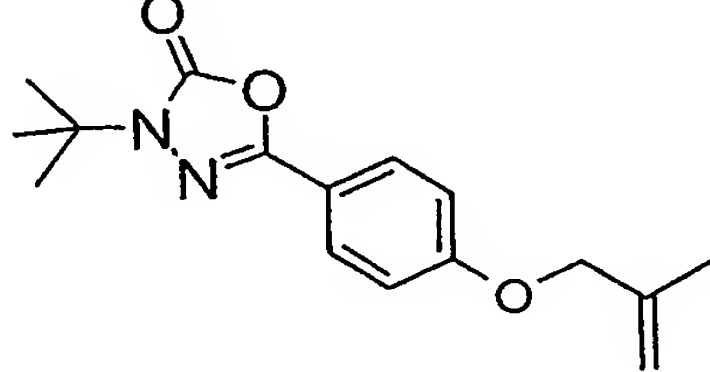
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1.25		Oil
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1.27		4.15 (s,2H), 4.57 (s,2H), 4.60 (d,2H), 5.40 (m,2H), 6.12 (t,1H), 6.88 (s,2H), 6.98 (t,1H), 8.51 (d,2H)
1.28		4.59 (s,2H), 4.60 (d,2H), 4.88 (s,2H), 5.49 (m,2H), 6.12 (t,1H), 6.88 (s,2H), 7.03 (d,2H), 7.44-7.80 (m,5H), 7.83 (d,2H)
1.29		
1.30		
1.31		2.39 (s,3H), 4.53 (s,2H), 4.59 (d,2H), 4.98 (s,2H), 5.42 (m,2H), 6.12 (t,1H), 6.86 (s,2H), 7.28 (m,1H), 7.69 (m,1H), 7.91 (m,1H), 8.60 (m,1H)

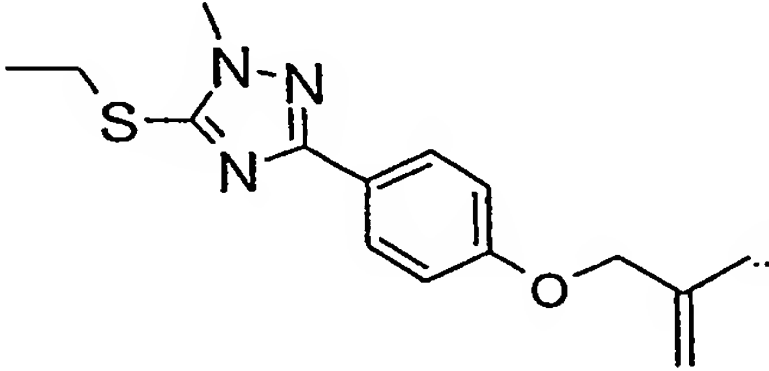
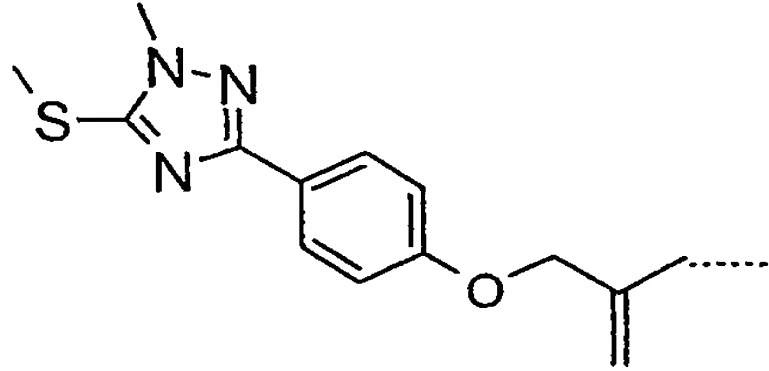
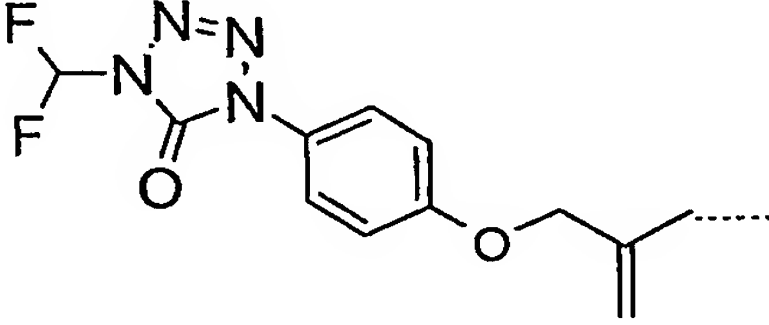
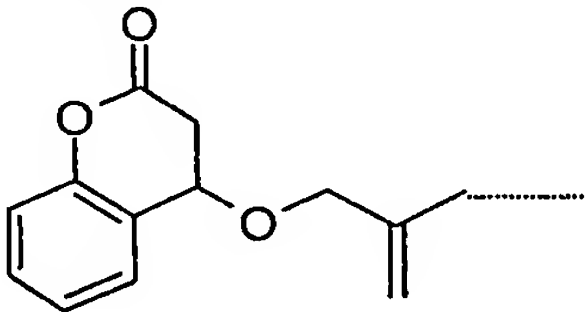
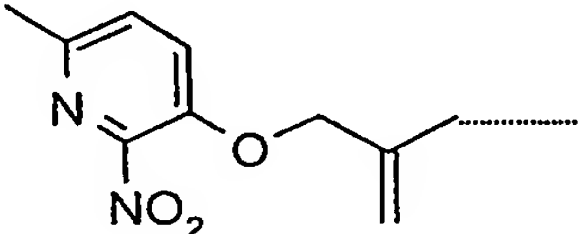
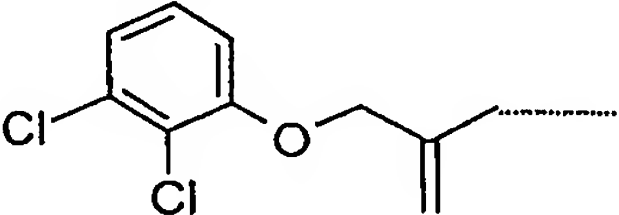
No.	R	¹ H-NMR (CDCl ₃) 300 MHz; m.p. or η_D^{20}
1.32		Oil
1.33		Oil
1.34		Oil
1.35		Oil
1.36		Oil

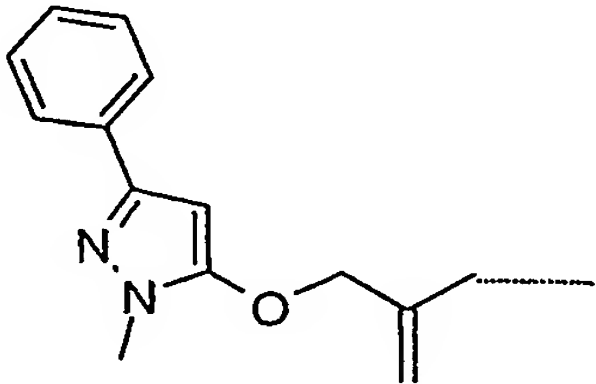
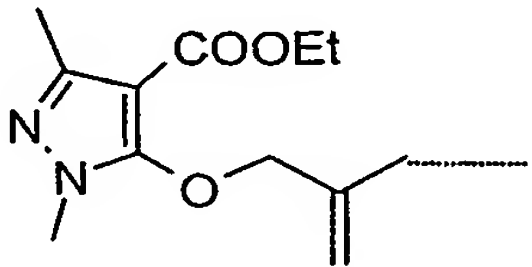
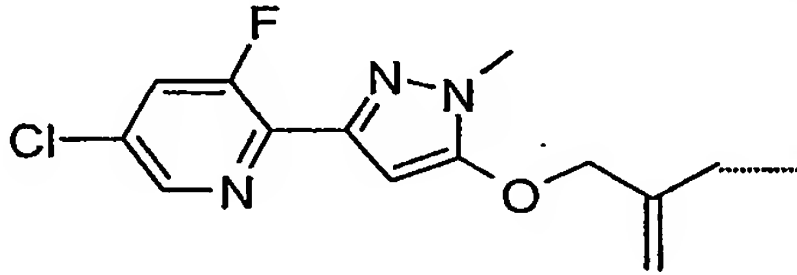
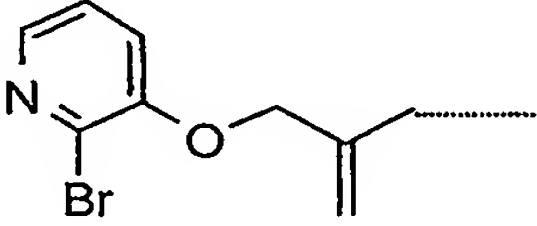
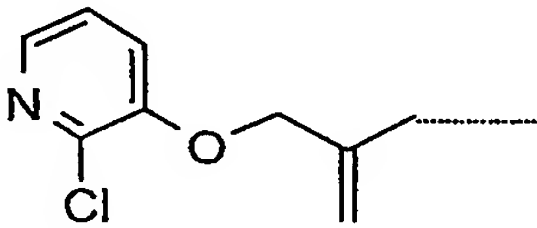
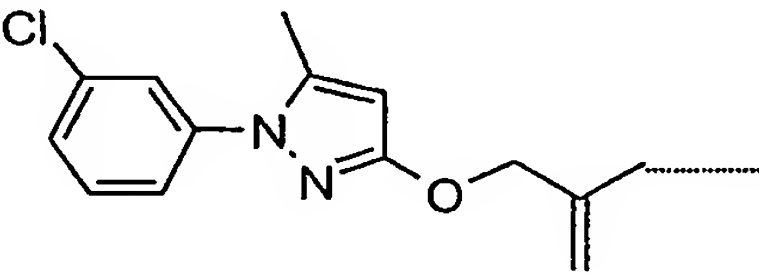
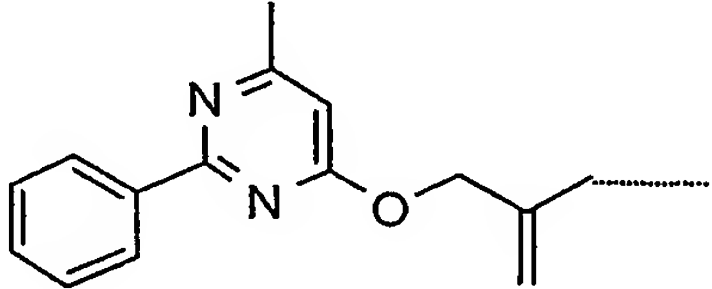
No.	R	¹ H-NMR (CDCl ₃) 300 MHz; m.p. or η_D^{20}
1.37		Oil
1.38		
1.39		
1.40		
1.41		Oil

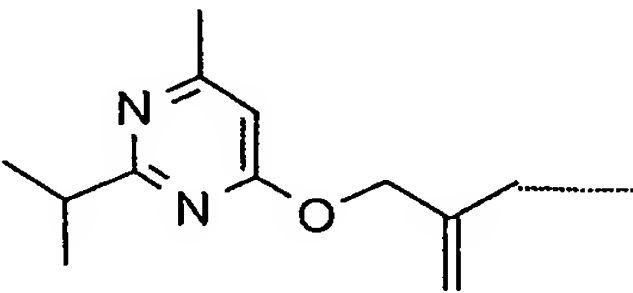
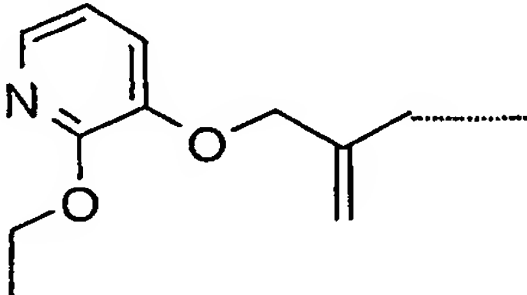
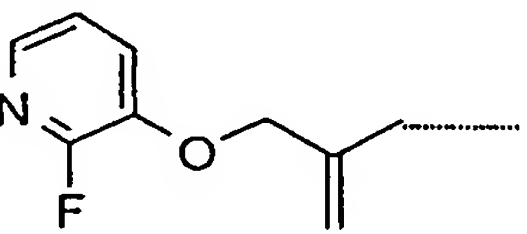
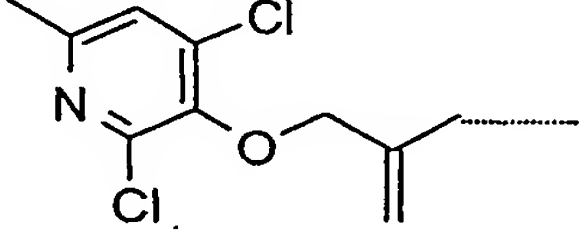
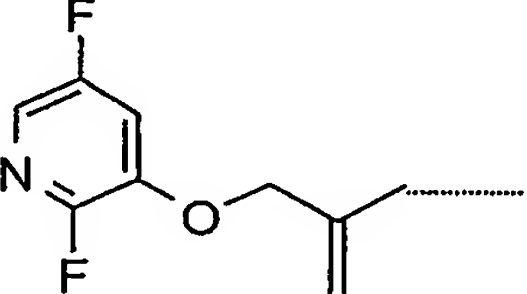
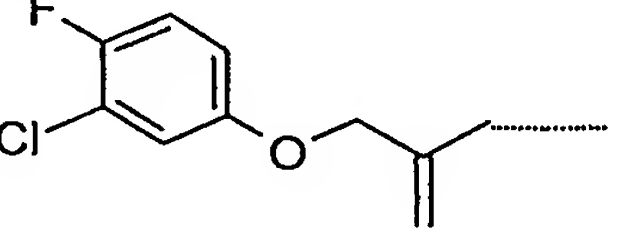
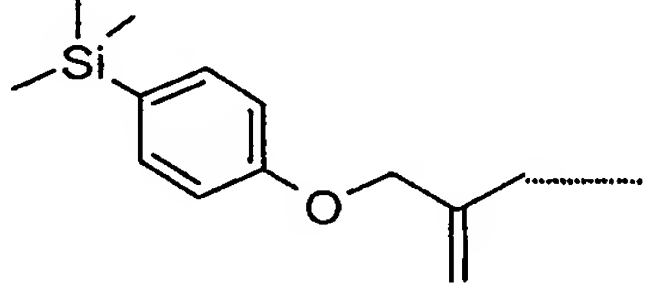
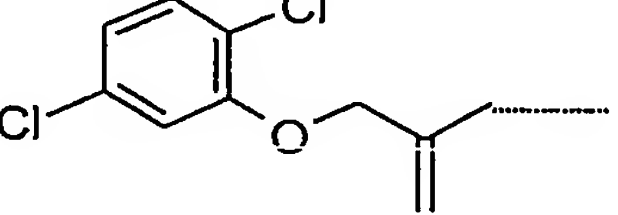
No.	R	¹ H-NMR (CDCl ₃) 300 MHz; m.p. or η_D^{20}
1.42		m.p.: 80-86°C
1.43		Oil
1.44		Oil
1.45		
1.46		Oil
1.47		Oil

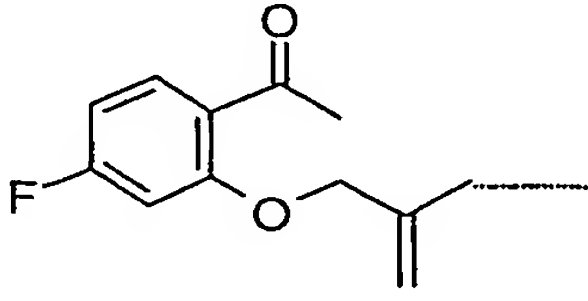
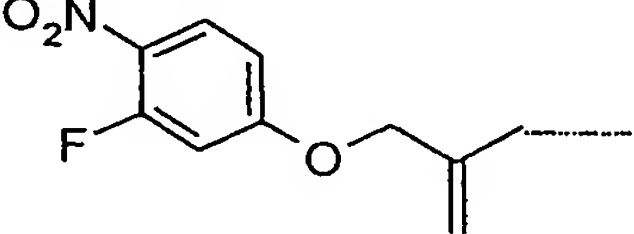
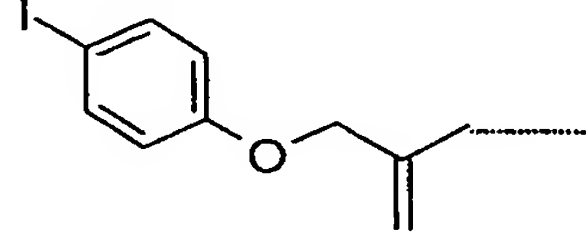
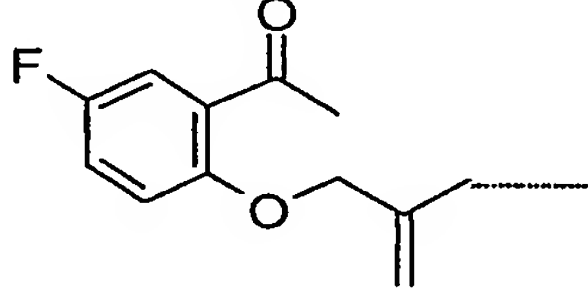
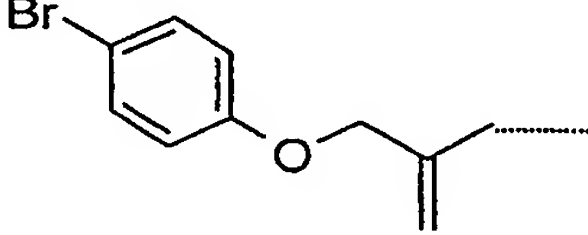
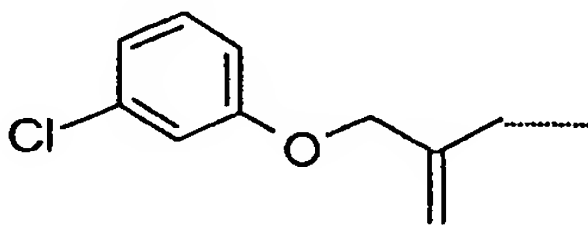
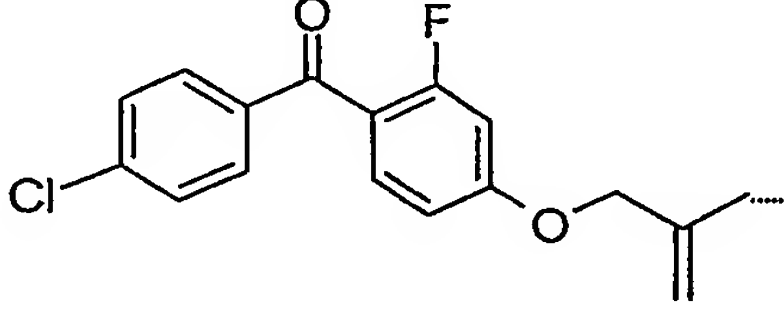
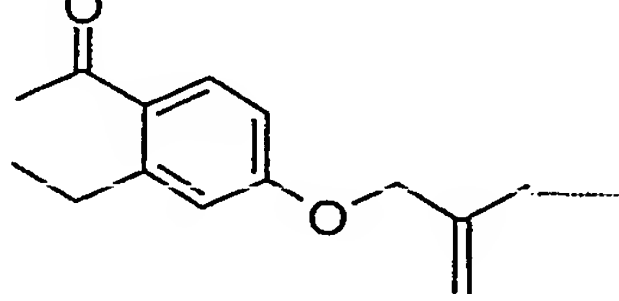
No.	R	¹ H-NMR (CDCl ₃) 300 MHz; m.p. or n _D ²⁰
1.48		Oil
1.49		Oil
1.50		Oil
1.51		Oil
1.52		Oil
1.53		Oil
1.54		m.p.: 70-74°C

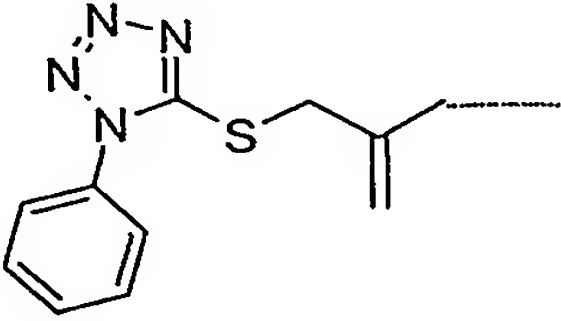
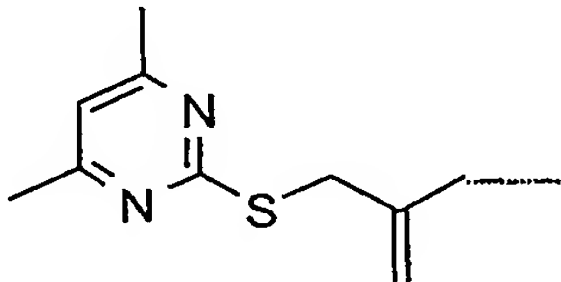
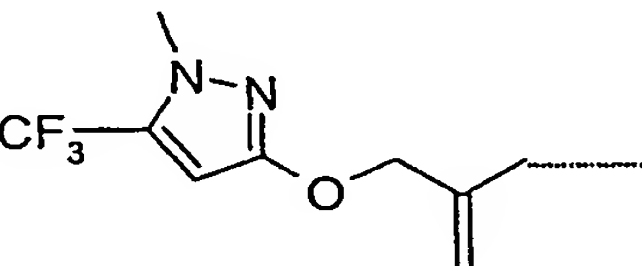
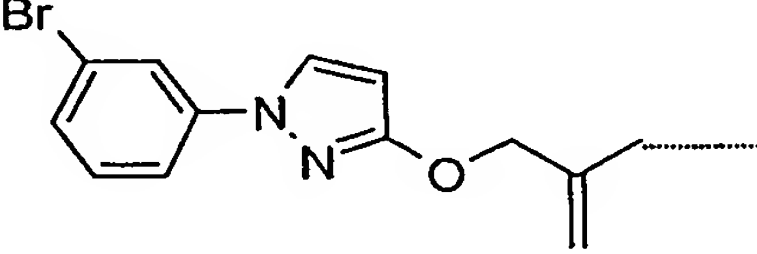
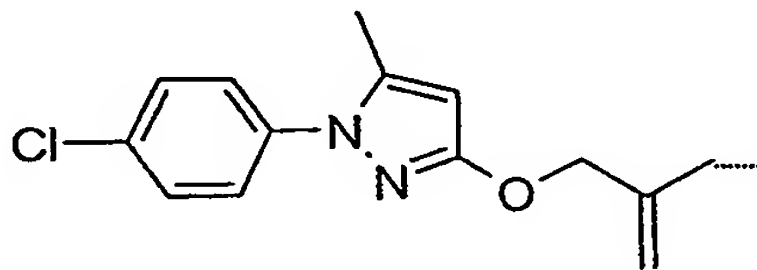
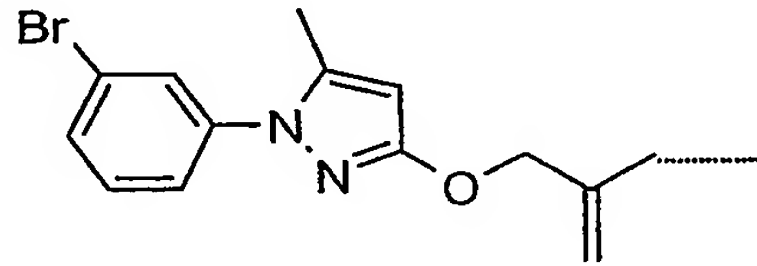
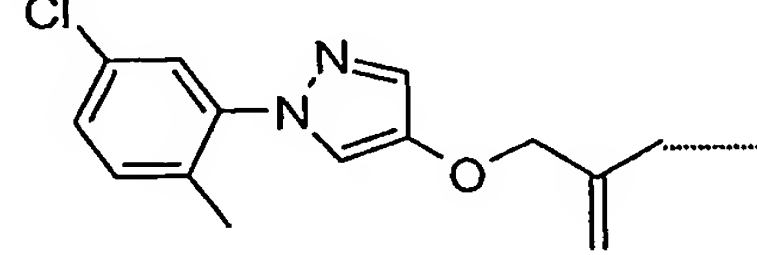
No.	R	¹ H-NMR (CDCl ₃) 300 MHz; m.p. or n _D ²⁰
1.55		Oil
1.56		Oil
1.57		m.p.: 69-72°C
1.58		m.p.: 67-69°C
1.59		Oil
1.60		Oil

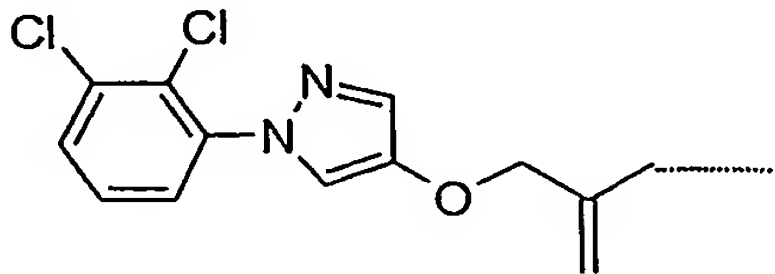
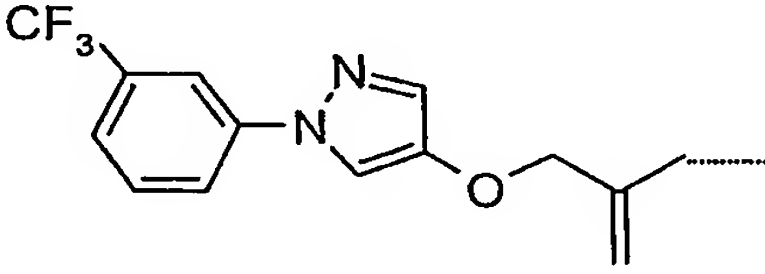
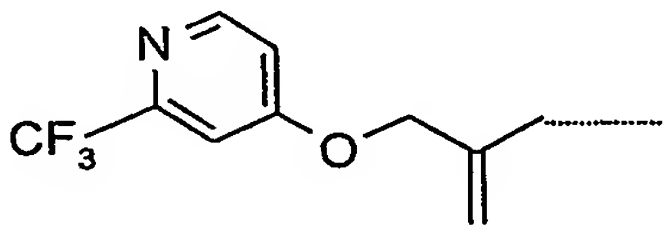
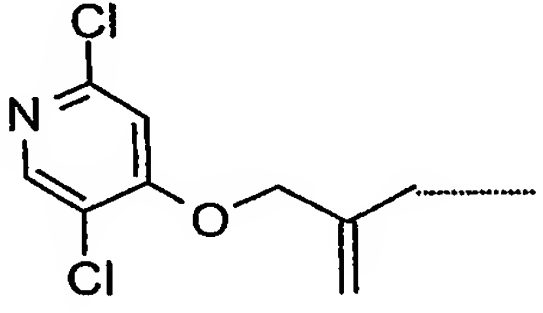
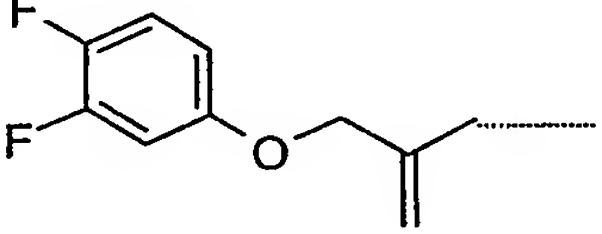
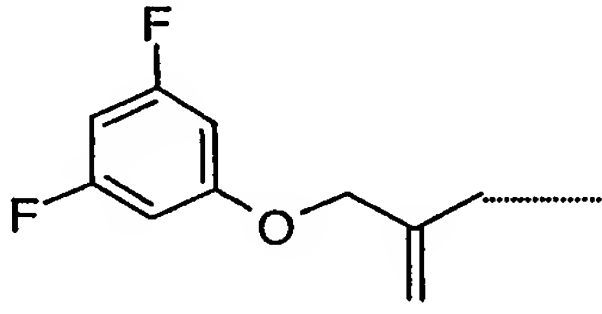
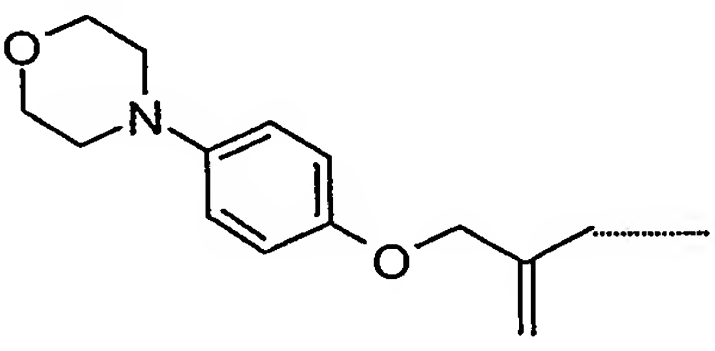
No.	R	¹ H-NMR (CDCl ₃) 300 MHz; m.p. or n _D ²⁰
1.61		Oil
1.62		Oil
1.63		m.p.: 95-99°C
1.64		Resin
1.65		Resin
1.66		Resin

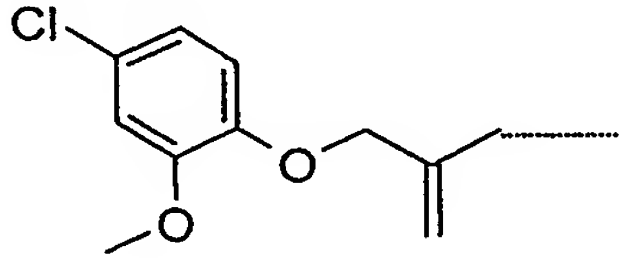
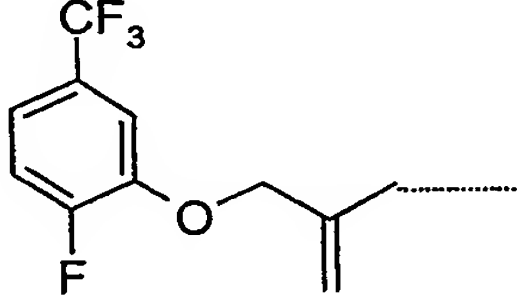
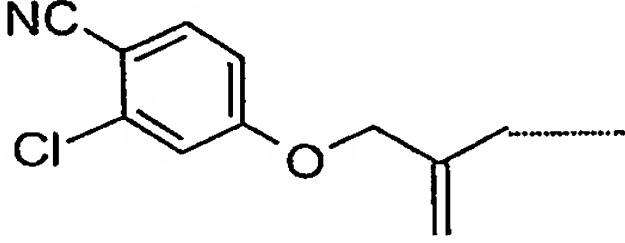
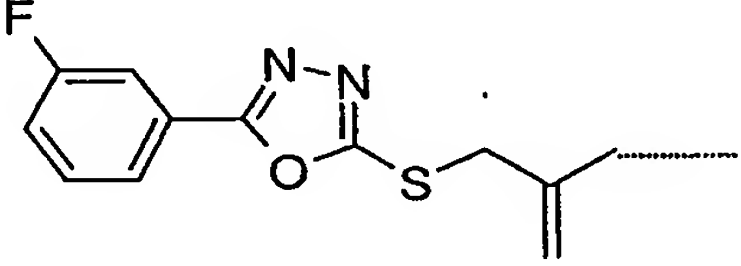
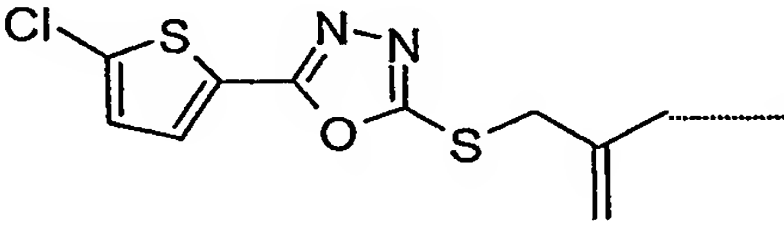
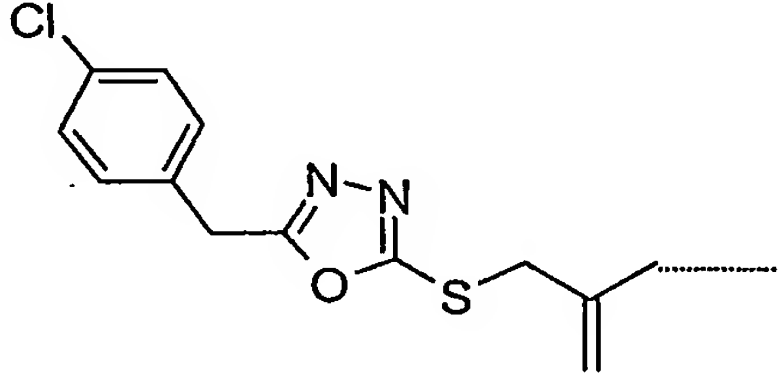
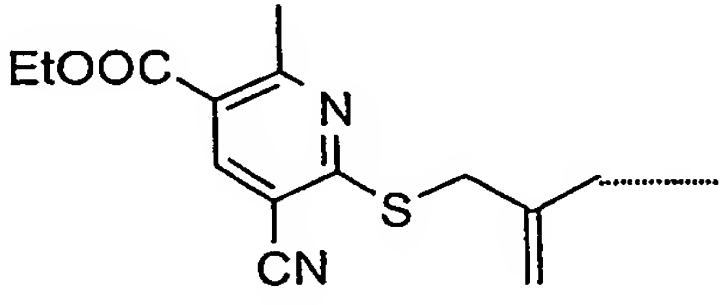
No.	R	¹ H-NMR (CDCl ₃) 300 MHz; m.p. or n _D ²⁰
1.67		Resin
1.68		Resin
1.69		Resin
1.70		Resin
1.71		Resin
1.72		Resin
1.73		Resin

No.	R	¹ H-NMR (CDCl ₃) 300 MHz; m.p. or n _D ²⁰
1.74		Resin
1.75		Resin
1.76		Resin
1.77		Resin
1.78		Resin
1.79		Resin
1.80		Resin
1.81		Resin

No.	R	¹ H-NMR (CDCl ₃) 300 MHz; m.p. or n _D ²⁰
1.82		Resin
1.83		Resin
1.84		Resin
1.85		Resin
1.86		Resin
1.87		Resin
1.88		Resin
1.89		Resin

No.	R	¹ H-NMR (CDCl ₃) 300 MHz; m.p. or n _D ²⁰
1.90		Resin
1.91		Resin
1.92		Resin
1.93		Resin
1.94		Resin
1.95		Resin
1.96		Resin

No.	R	¹ H-NMR (CDCl ₃) 300 MHz; m.p. or n_D^{20}
1.97		Resin
1.98		Resin
1.99		Resin
1.100		Resin
1.101		Resin
1.102		Resin
1.103		Resin

No.	R	¹ H-NMR (CDCl ₃) 300 MHz; m.p. or n _D ²⁰
1.104		Resin
1.105		Resin
1.106		Resin
1.107		Resin
1.108		Resin
1.109		Resin
1.110		Resin

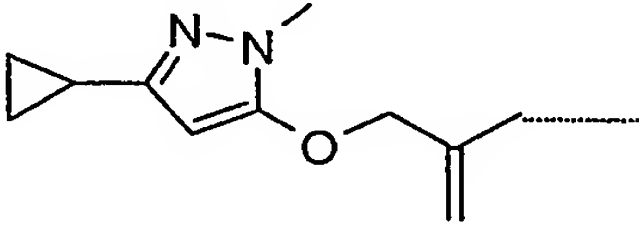
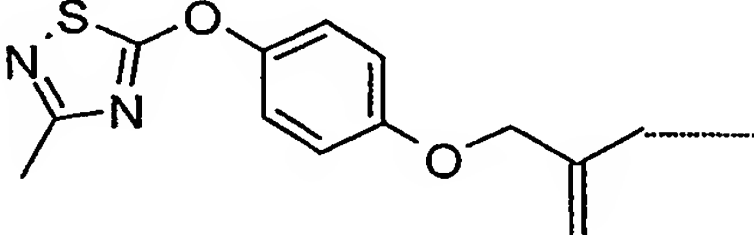
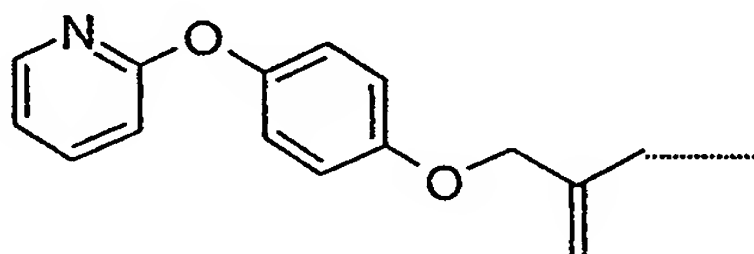
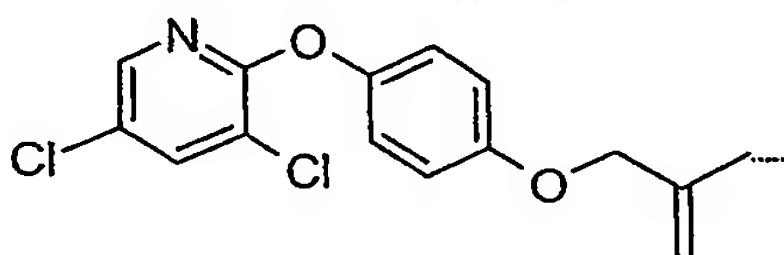
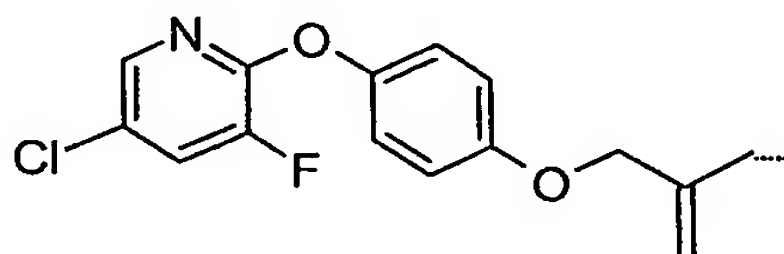
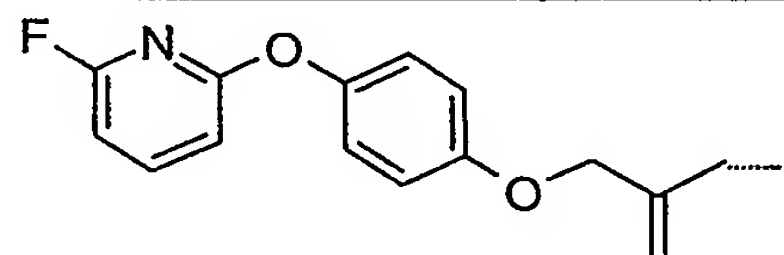
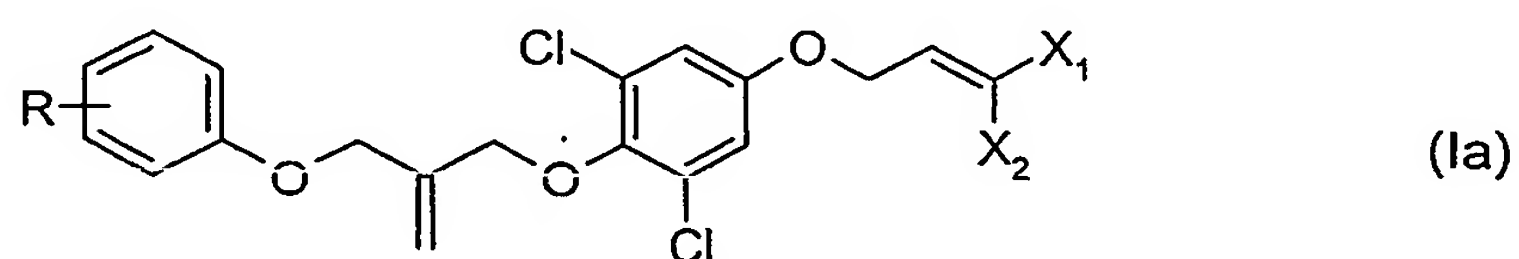
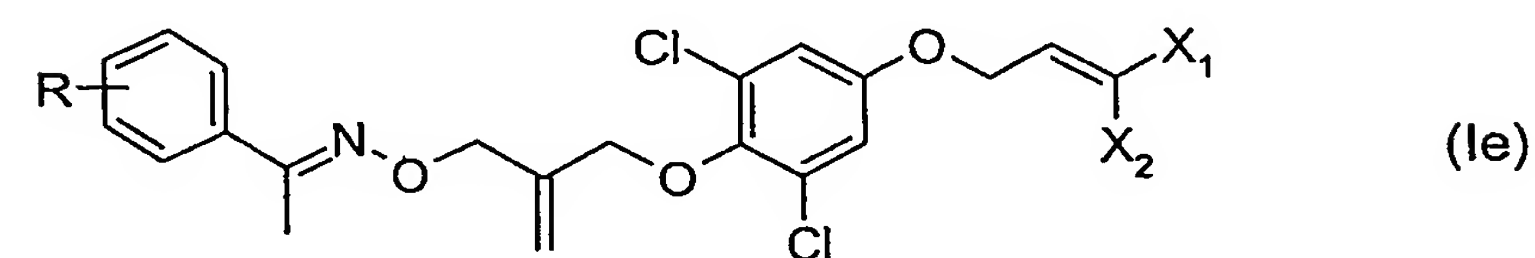
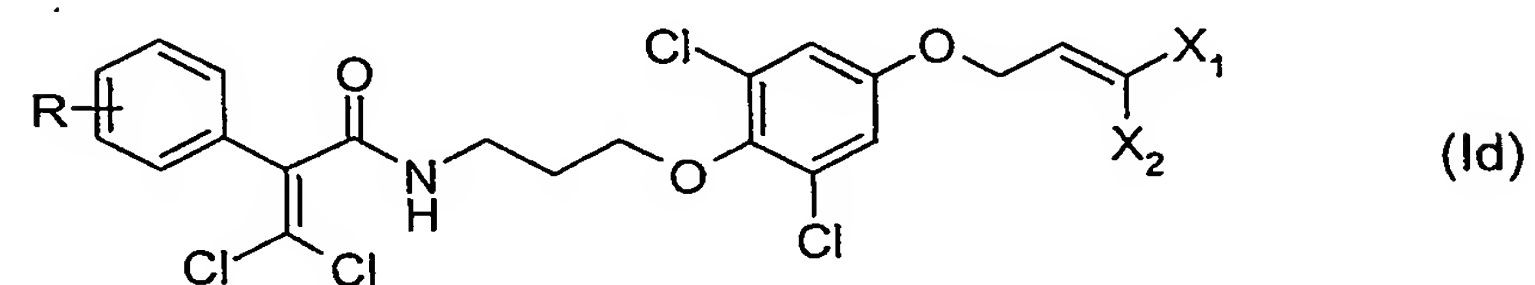
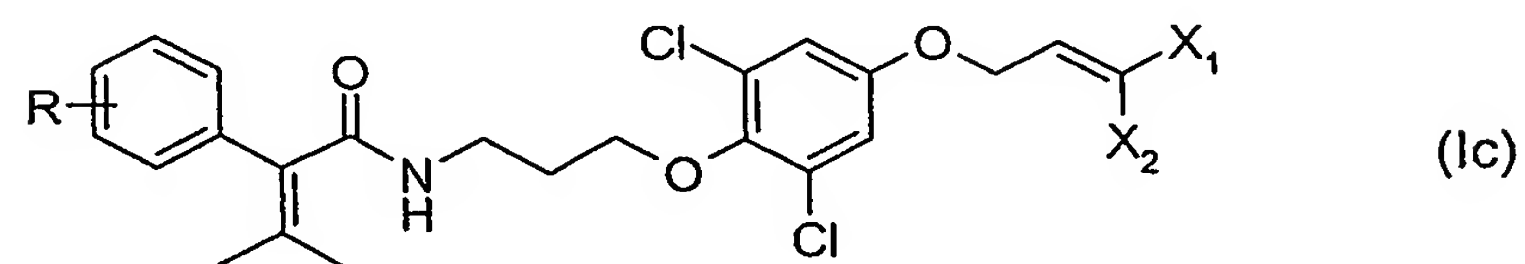
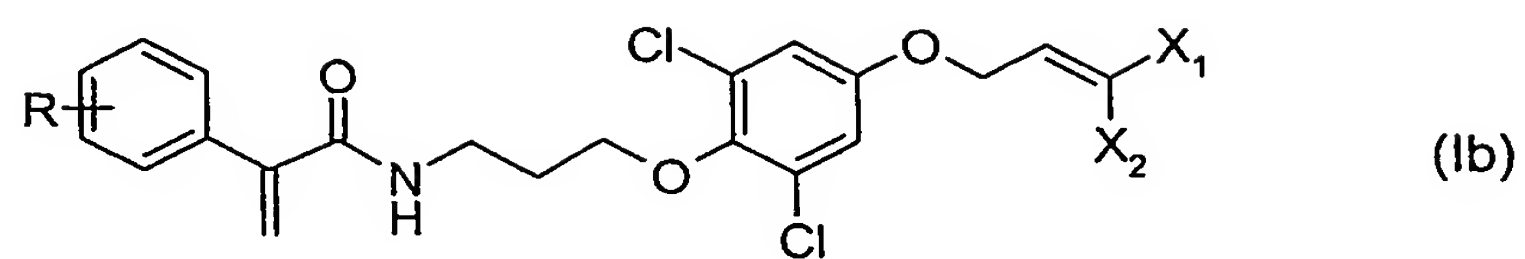
No.	R	¹ H-NMR (CDCl ₃) 300 MHz; m.p. or n _D ²⁰
1.111		Resin
1.112		Resin
1.113		Resin
1.114		Resin
1.115		Resin
1.116		Resin

Table A: Compounds of formulae



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No.	R
A.1	4-F
A.2	4-Cl
A.3	4-Br
A.4	4-CN
A.5	4-NO ₂
A.6	4-CF ₃
A.7	4-OCF ₃
A.8	2-Cl-4-F
A.9	2-Cl-4-Br
A.10	2-Cl-4-CN
A.11	2-Cl-4-NO ₂
A.12	2-Cl-4-CF ₃
A.13	2,4-difluoro
A.14	3,4-difluoro
A.15	3,5-difluoro
A.16	2,4-dichloro
A.17	3,4-dichloro
A.18	3,5-dichloro
A.19	4-OCH ₃

No.	R
A.20	4-OC ₂ H ₅
A.21	4-O-n-C ₃ H ₇
A.22	4-O-n-C ₄ H ₉
A.23	4-O-n-C ₅ H ₁₁
A.24	4-O-n-C ₆ H ₁₃
A.25	4-O-iso-C ₃ H ₇
A.26	4-O-iso-C ₄ H ₉
A.27	4-O-iso-C ₅ H ₁₁
A.28	4-O-tert-C ₄ H ₉
A.29	4-OCH ₂ C(CH ₃) ₃
A.30	4-OCH ₂ (cyclopropyl)
A.31	4-OCH ₂ CF ₃
A.32	4-OCH ₂ CHF ₂
A.33	4-OCH ₂ CH ₂ F
A.34	4-OCH ₂ CH=CH ₂
A.35	4-OCH ₂ C≡CH
A.36	4-OCH ₂ C≡CCH ₃
A.37	4-CH ₂ OCH ₃
A.38	4-CH ₂ OC ₂ H ₅
A.39	4-CH ₂ O-n-C ₃ H ₇
A.40	4-CH ₂ O-n-C ₄ H ₉
A.41	4-CH ₂ O-n-C ₅ H ₁₁
A.42	4-CH ₂ O-n-C ₆ H ₁₃
A.43	4-CH ₂ O-iso-C ₃ H ₇
A.44	4-CH ₂ O-iso-C ₄ H ₉
A.45	4-CH ₂ O-iso-C ₅ H ₁₁
A.46	4-CH ₂ O-tert-C ₄ H ₉
A.47	4-CH ₂ OCH ₂ C(CH ₃) ₃
A.48	4-CH ₂ OCH ₂ (cyclopropyl)
A.49	4-CH ₂ OCF ₃
A.50	4-CH ₂ OCH ₂ CF ₃
A.51	4-CH ₂ OCH ₂ CHF ₂
A.52	4-CH ₂ OCH ₂ CH ₂ F
A.53	4-CH ₂ OCH ₂ CH=CH ₂
A.54	4-CH ₂ OCH ₂ C≡CH
A.55	4-CH ₂ OCH ₂ C≡CCH ₃
A.56	4-C(=O)CH ₃

No.	R
A.57	4-C(=O)C ₂ H ₅
A.58	4-C(=O)-n-C ₃ H ₇
A.59	4-C(=O)-n-C ₄ H ₉
A.60	4-C(=O)-n-C ₅ H ₁₁
A.61	4-C(=O)-n-C ₆ H ₁₃
A.62	4-C(=O)-iso-C ₃ H ₇
A.63	4-C(=O)-iso-C ₄ H ₉
A.64	4-C(=O)-iso-C ₅ H ₁₁
A.65	4-C(=O)-tert-C ₄ H ₉
A.66	4-C(=O)-cyclopropyl
A.67	4-C(=N-OCH ₃)CH ₃
A.68	4-C(=N-OCH ₃)C ₂ H ₅
A.69	4-C(=N-OCH ₃)-n-C ₃ H ₇
A.70	4-C(=N-OCH ₃)-n-C ₄ H ₉
A.71	4-C(=N-OCH ₃)-n-C ₅ H ₁₁
A.72	4-C(=N-OCH ₃)-n-C ₆ H ₁₃
A.73	4-C(=N-OCH ₃)-iso-C ₃ H ₇
A.74	4-C(=N-OCH ₃)-iso-C ₄ H ₉
A.75	4-C(=N-OCH ₃)-iso-C ₅ H ₁₁
A.76	4-C(=N-OCH ₃)-tert-C ₄ H ₉
A.77	4-C(=N-OCH ₃)-cyclopropyl
A.78	4-C(=N-OCH ₂ CH ₃)CH ₃
A.79	4-C(=N-OCH ₂ CH ₃)C ₂ H ₅
A.80	4-C(=N-OCH ₂ CH ₃)-n-C ₃ H ₇
A.81	4-C(=N-OCH ₂ CH ₃)-n-C ₄ H ₉
A.82	4-C(=N-OCH ₂ CH ₃)-n-C ₅ H ₁₁
A.83	4-C(=N-OCH ₂ CH ₃)-n-C ₆ H ₁₃
A.84	4-C(=N-OCH ₂ CH ₃)-iso-C ₃ H ₇
A.85	4-C(=N-OCH ₂ CH ₃)-iso-C ₄ H ₉
A.86	4-C(=N-OCH ₂ CH ₃)-iso-C ₅ H ₁₁
A.87	4-C(=N-OCH ₂ CH ₃)-tert-C ₄ H ₉
A.88	4-C(=N-OCH ₂ CH ₃)-cyclopropyl
A.89	4-C(=N-OCH ₂ CH=CH ₂)CH ₃
A.90	4-C(=N-OCH ₂ CH=CH ₂)C ₂ H ₅
A.91	4-C(=N-OCH ₂ CH=CH ₂)-n-C ₃ H ₇
A.92	4-C(=N-OCH ₂ CH=CH ₂)-n-C ₄ H ₉
A.93	4-C(=N-OCH ₂ CH=CH ₂)-n-C ₅ H ₁₁

No.	R
A.94	4-C(=N-OCH ₂ CH=CH ₂)-n-C ₆ H ₁₃
A.95	4-C(=N-OCH ₂ CH=CH ₂)-iso-C ₃ H ₇
A.96	4-C(=N-OCH ₂ CH=CH ₂)-iso-C ₄ H ₉
A.97	4-C(=N-OCH ₂ CH=CH ₂)-iso-C ₅ H ₁₁
A.98	4-C(=N-OCH ₂ CH=CH ₂)-tert-C ₄ H ₉
A.99	4-C(=N-OCH ₂ CH=CH ₂)-cyclopropyl
A.100	4-C(=N-OCH ₂ C≡CH)CH ₃
A.101	4-C(=N-OCH ₂ C≡CH)C ₂ H ₅
A.102	4-C(=N-OCH ₂ C≡CH)-n-C ₃ H ₇
A.103	4-C(=N-OCH ₂ C≡CH)-n-C ₄ H ₉
A.104	4-C(=N-OCH ₂ C≡CH)-n-C ₅ H ₁₁
A.105	4-C(=N-OCH ₂ C≡CH)-n-C ₆ H ₁₃
A.106	4-C(=N-OCH ₂ C≡CH)-iso-C ₃ H ₇
A.107	4-C(=N-OCH ₂ C≡CH)-iso-C ₄ H ₉
A.108	4-C(=N-OCH ₂ C≡CH)-iso-C ₅ H ₁₁
A.109	4-C(=N-OCH ₂ C≡CH)-tert-C ₄ H ₉
A.110	4-C(=N-OCH ₂ C≡CH)-cyclopropyl
A.111	4-NHC(=O)OCH ₃
A.112	4-NHC(=O)OC ₂ H ₅
A.113	4-NHC(=O)O-n-C ₃ H ₇
A.114	4-NHC(=O)O-n-C ₄ H ₉
A.115	4-NHC(=O)OCH ₂ CH=CH ₂
A.116	4-NHC(=O)OCH ₂ C≡CCH ₃
A.117	4-CH ₂ NHC(=O)OCH ₃
A.118	4-CH ₂ NHC(=O)OC ₂ H ₅
A.119	4-CH ₂ NHC(=O)O-n-C ₃ H ₇
A.120	4-CH ₂ NHC(=O)O-n-C ₄ H ₉
A.121	4-CH ₂ NHC(=O)OCH ₂ CH=CH ₂
A.122	4-CH ₂ NHC(=O)OCH ₂ C≡CCH ₃
A.123	4-N(CH ₃)C(=O)OCH ₃
A.124	4-N(CH ₃)C(=O)OC ₂ H ₅
A.125	4-N(CH ₃)C(=O)O-n-C ₃ H ₇
A.126	4-N(CH ₃)C(=O)O-n-C ₄ H ₉
A.127	4-N(CH ₃)C(=O)OCH ₂ CH=CH ₂
A.128	4-N(CH ₃)C(=O)OCH ₂ C≡CCH ₃
A.129	4-CH ₂ N(CH ₃)C(=O)OCH ₃
A.130	4-CH ₂ N(CH ₃)C(=O)OC ₂ H ₅

No.	R
A.131	4-CH ₂ N(CH ₃)C(=O)O-n-C ₃ H ₇
A.132	4-CH ₂ N(CH ₃)C(=O)O-n-C ₄ H ₉
A.133	4-CH ₂ N(CH ₃)C(=O)OCH ₂ CH=CH ₂
A.134	4-CH ₂ N(CH ₃)C(=O)OCH ₂ C≡CCH ₃
A.135	4-N(C ₂ H ₅)C(=O)OCH ₃
A.136	4-N(C ₂ H ₅)C(=O)OC ₂ H ₅
A.137	4-N(C ₂ H ₅)C(=O)O-n-C ₃ H ₇
A.138	4-N(C ₂ H ₅)C(=O)O-n-C ₄ H ₉
A.139	4-N(C ₂ H ₅)C(=O)OCH ₂ CH=CH ₂
A.140	4-N(C ₂ H ₅)C(=O)OCH ₂ C≡CCH ₃
A.141	4-CH ₂ N(C ₂ H ₅)C(=O)OCH ₃
A.142	4-CH ₂ N(C ₂ H ₅)C(=O)OC ₂ H ₅
A.143	4-CH ₂ N(C ₂ H ₅)C(=O)O-n-C ₃ H ₇
A.144	4-CH ₂ N(C ₂ H ₅)C(=O)O-n-C ₄ H ₉
A.145	4-CH ₂ N(C ₂ H ₅)C(=O)OCH ₂ CH=CH ₂
A.146	4-CH ₂ N(C ₂ H ₅)C(=O)OCH ₂ C≡CCH ₃

Table 2: A compound of general formula (Ia) wherein X₁ and X₂ are chlorine and the substituent R for each compound corresponds to a line A.1 to A.146 of Table A.

Table 3: A compound of general formula (Ib) wherein X₁ and X₂ are chlorine and the substituent R for each compound corresponds to a line A.1 to A.146 of Table A.

Table 4: A compound of general formula (Ic) wherein X₁ and X₂ are chlorine and the substituent R for each compound corresponds to a line A.1 to A.146 of Table A.

Table 5: A compound of general formula (Id) wherein X₁ and X₂ are chlorine and the substituent R for each compound corresponds to a line A.1 to A.146 of Table A.

Table 6: A compound of general formula (Ie) wherein X₁ and X₂ are chlorine and the substituent R for each compound corresponds to a line A.1 to A.146 of Table A.

Table 7: A compound of general formula (Ia) wherein X₁ and X₂ are bromine and the substituent R for each compound corresponds to a line A.1 to A.146 of Table A.

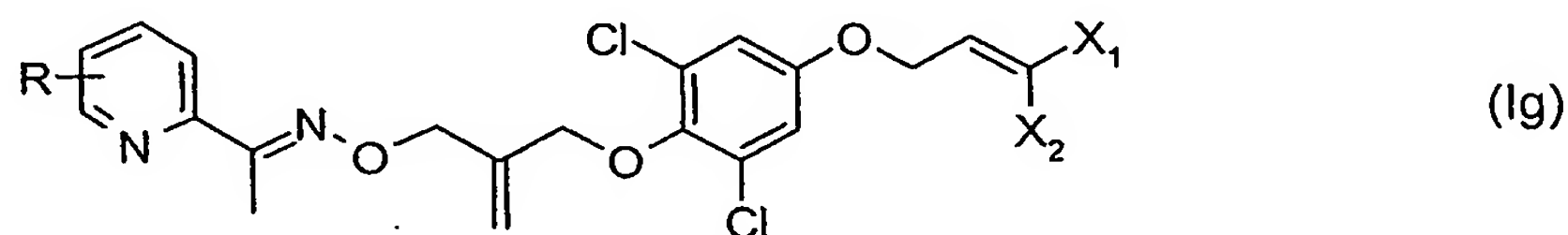
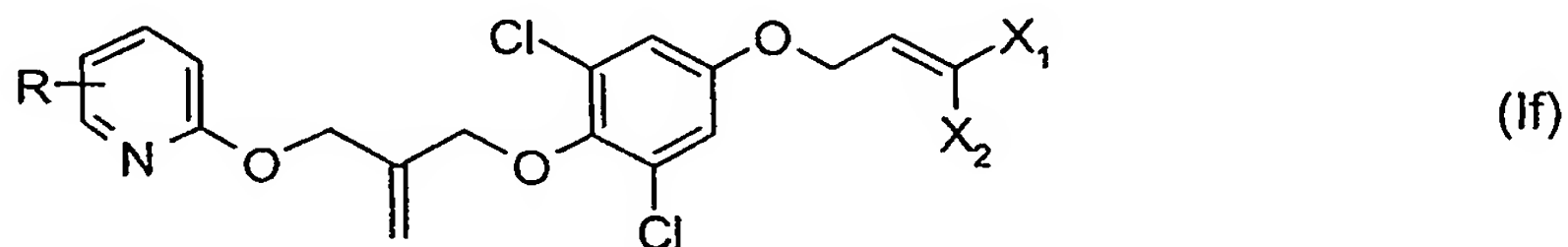
Table 8: A compound of general formula (Ib) wherein X₁ and X₂ are bromine and the substituent R for each compound corresponds to a line A.1 to A.146 of Table A.

Table 9: A compound of general formula (Ic) wherein X₁ and X₂ are bromine and the substituent R for each compound corresponds to a line A.1 to A.146 of Table A.

Table 10: A compound of general formula (Id) wherein X_1 and X_2 are bromine and the substituent R for each compound corresponds to a line A.1 to A.146 of Table A.

Table 11: A compound of general formula (Ie) wherein X_1 and X_2 are bromine and the substituent R for each compound corresponds to a line A.1 to A.146 of Table A.

Table B: Compounds of formulae



No.	R
B.1	5-F
B.2	5-Cl
B.3	5-Br
B.4	5-CN
B.5	5-NO ₂
B.6	5-CF ₃
B.7	5-OCF ₃
B.8	3-Cl-5-F
B.9	3-Cl-5-Br
B.10	3-Cl-5-CN
B.11	3-Cl-5-NO ₂
B.12	3-Cl-5-CF ₃
B.13	3-Br-5-CF ₃
B.14	3-F-5-CF ₃
B.15	3,5-difluoro
B.16	3,5-dichloro

Table 12: A compound of general formula (If) wherein X_1 and X_2 are chlorine and the substituent R for each compound corresponds to a line B.1 to B.16 of Table B.

Table 13: A compound of general formula (Ig) wherein X₁ and X₂ are chlorine and the substituent R for each compound corresponds to a line B.1 to B.16 of Table B.

Table 14: A compound of general formula (If) wherein X₁ and X₂ are bromine and the substituent R for each compound corresponds to a line B.1 to B.16 of Table B.

Table 15: A compound of general formula (Ig) wherein X₁ and X₂ are bromine and the substituent R for each compound corresponds to a line B.1 to B.16 of Table B.

Formulation Examples (% = percent by weight)

Example F1: Emulsifiable concentrates

	a)	b)	c)
active ingredient	25 %	40 %	50 %
calcium dodecylbenzenesulfonate	5 %	8 %	6 %
castor oil polyethylene glycol ether (36 mol EO)	5 %	-	-
tributylphenol polyethylene glycol ether (30 mol EO)	-	12 %	4 %
cyclohexanone	-	15 %	20 %
xylene mixture	65 %	25 %	20 %

Mixing finely ground active ingredient and additives gives an emulsifiable concentrate which yields emulsions of the desired concentration on dilution with water.

Example F2: Solutions

	a)	b)	c)	d)
active ingredient	80 %	10 %	5 %	95 %
ethylene glycol monomethyl ether	20 %	-	-	-
polyethylene glycol (MW 400)	-	70 %	-	-
N-methylpyrrolid-2-one	-	20 %	-	-
epoxidised coconut oil	-	-	1 %	5 %
benzine (boiling range: 160-190°)	-	-	94 %	-

Mixing finely ground active ingredient and additives gives a solution suitable for use in the form of microdrops.

Example F3: Granules

	a)	b)	c)	d)
active ingredient	5 %	10 %	8 %	21 %
kaolin	94 %	-	79 %	54 %
highly dispersed silicic acid	1 %	-	13 %	7 %
attapulgit	-	90 %	-	18 %

The active ingredient is dissolved in dichloromethane, the solution is sprayed onto the carrier mixture and the solvent is evaporated off *in vacuo*.

Biological Examples

Example B1: Action against *Heliothis virescens* caterpillars

Young soybean plants are sprayed with an aqueous emulsion spray mixture comprising 400 ppm of test compound. After the spray-coating has dried, the soybean plants are populated with 10 caterpillars of *Heliothis virescens* in the first stage and placed in a plastics container. Evaluation is made 6 days later. The percentage reduction in population and the percentage reduction in feeding damage (% activity) are determined by comparing the number of dead caterpillars and the feeding damage on the treated plants with that on the untreated plants.

The compounds of the Tables exhibit good activity against *Heliothis virescens* in this test. In particular, the compounds 1.2 to 1.6, 1.8 to 1.9, 1.11, 1.13 to 1.14, 1.18 to 1.19, 1.32 to 1.37, 1.41 to 1.44 and 1.46 to 1.115 are more than 80 % effective.

Example B2: Action against *Plutella xylostella* caterpillars

Young cabbage plants are sprayed with an aqueous emulsion spray mixture comprising 400 ppm of test compound. After the spray-coating has dried, the cabbage plants are populated with 10 caterpillars of *Plutella xylostella* in the third stage and placed in a plastics container. Evaluation is made 3 days later. The percentage reduction in population and the percentage reduction in feeding damage (% activity) are determined by comparing the number of dead caterpillars and the feeding damage on the treated plants with that on the untreated plants.

The compounds of the Tables exhibit good activity against *Plutella xylostella* in this test. In particular, the compounds 1.2 to 1.6, 1.8 to 1.9, 1.11, 1.13 to 1.14, 1.18 to 1.19, 1.32 to 1.37, 1.41 to 1.44 and 1.46 to 1.115 are more than 80 % effective.

Example B3: Action against *Spodoptera littoralis*

Young soybean plants are sprayed with an aqueous emulsion spray mixture comprising 400 ppm of test compound and, after the spray-coating has dried, the plants are populated with 10 caterpillars of *Spodoptera littoralis* in the first stage and then placed in a plastics container. 3 days later, the percentage reduction in population and the percentage reduction

in feeding damage (% activity) are determined by comparing the number of dead caterpillars and the feeding damage on the treated plants with that on untreated plants.

The compounds of the Tables exhibit good activity against *Spodoptera littoralis* in this test. In particular, the compounds 1.2 to 1.6, 1.8 to 1.9, 1.11, 1.13 to 1.14, 1.18 to 1.19, 1.32 to 1.37, 1.41 to 1.44 and 1.46 to 1.115 are more than 80 % effective.